RAILROAD GAZETTE

FRIDAY, JANUARY 7.

The Iron and Steel Trade in 1886.

The *Bulletin* of the American Iron & Steel Association, in its last issue, gives the following summary of the iron trade for 1886:

Our iron and steel industries were especially active during 1886, and this activity was fairly distributed throughout the year. An improvement in the condition of most of these industries had commenced in 1885, and when the new year opened and the temporary discouragement produced by the Connellsville strike had disappeared, the certainty of a much more active year than 1885 had become assured. Orders became more abundant, and, except in one or two branches, they have since continued to bear a most favorable relation to our producing capacity. Our production in 1886 of pig-iron, Bessemer steel and steel rails, open-hearth steel, structural iron and steel, and some other products has accordingly been much larger than in 1885, and our production of pig-iron, Bessemer steel, Bessemer steel rails, and open-hearth steel has been much the largest in our history. We estimate the production of these four leading products in 1886 to have been as follows, in gross tons, compared with the production in 1885.

Products.	1885. Gross tons.	1886. Gros tons.
Pig-iron	4,044,526	5,f00,000
Bessemer steel ingots	1,519,430	2,000,000
Bessemer steel rails	959,471	1,500 000
Open-hearth steel	133,375	200,000

The figures for 1886 have been estimated with care, and we believe will be fully verified by the official returns which we are now collecting from the manufacturers They are marvelous in their mere magnitude, but more marvelous still in showing our progress as iron and steel producers in one year.

Our production of iron ore in 1886 was about 10,000,000 tons, and we imported about 1,000,000 tons.

Notwithstanding the steady increase in the demand for iron and steel during 1886 it is remarkable that prices advanced so slightly. Such advance as was established came gradually, and in some instances, as in the case of bar iron, too slowly to meet the increased cost of production. The price of nails during the year actually declined, although the consumption increased. In this case the producing capacity of the country is much beyond its wants. In the following table we give the average prices of leading articles of iron and steel and of iron ore at the beginning and end of 1886.

Products.	Jan. 1.	Dec. 29.
No. 1 anthracite foundry pig iron, Philadelphia	$18.50	$20.50
Gray forge pig iron, Philadelphia	16.25	18.00
No. 1 gray forge pig iron, Lake ore, Pittsburgh	16.00	20.00
Best refined bar iron, Philadelphia	40.32	44.80
All muck-bar bar iron, Pittsburgh	38.08	42.56
Iron nails at store, Philadelphia	2.65	2.15
Iron nails at store, Pittsburgh	2.50	2.30
Steel rails at Eastern mills	34.50	37.00
Old rails, Philadelphia	21.00	24.75
Iron ore at Cleveland—		
No. 1 specular and magnetic Bessemer	6.50	7.00
No. 1 specular non-Bessemer	5.50	6.00

It may be said of the present prices for pig iron and steel rails that they have only recently been established, and that in the case of steel rails large contracts for delivery in 1887 have been made at $34 and $35.

Our importations of iron and steel during 1886 have been very heavy, and much in excess of the importations of 1885. In 1886 we imported about 400,000 tons of pig irom, about 75,000 tons of old iron, over 100,000 tons of steel blooms and billets, nearly 250,000 tons of tinplates, fully 125,000 tons of wire rods, and about 50,000 tons of steel rails. Our total importations of iron and steel in 1886 will amount to 1,000,000 tons.

The stocks of unsold pig iron in this country at the close of 1886 were probably no larger than at the close of 1885, when they amounted to 371,885 gross tons, which was a very small surplus when the pig-iron wants of the country are considered.

Notes at Aurora.

MACHINE SHOP.

The locomotive and car shops of the Chicago, Burlington & Quincy at Aurora, 37 miles from Chicago, are not only very complete and well equipped, but are full of interest to the visitor, as improved methods of working and manufacturing are constantly being introduced, and novel and original methods of investigation into the properties and qualities of materials are always in progress. The subsequent application of the experience thus gained is made use of in various methods designed to promote and secure increased economy and efficiency.

The machine shop is somewhat crowded, owing to the rapid increase in the number of locomotives which it has to keep in good working order. Some very efficient and novel devices for turning out work quickly are, however, in use.

The steel fire-box sheets are entirely punched with spiral punches with a central conical tit. These punches leave a remarkably smooth hole, quite equal to that produced by a well ground drill. The surface of the plate near the edge of the hole is, of course, slightly drawn by the punch, and the usual burr left by drilling is absent, but beyond this it would be difficult to tell by feel alone that the holes were not made by a drill.

A spiral drift is used in enlarging and making holes where two or more plates come together. This spiral drift takes such a shaving of metal at each cutting edge that it makes no burr between the adjoining plates. Spiral drifts are not, of course, new, but they are not used so extensively as they deserve. The drift can easily be made in the lathe, and at Aurora is also used for cast iron.

The tool room is very completely equipped with templates and various devices for insuring the use of standard sizes. The snaps for making the rivet heads are all formed to standard templates. Taps are made at Aurora to the United States Standard thread, and the taps and dies made are compared with a standard set in order to insure accurate adhesion to the standard. Milling cutters of various forms are made by means of a Brown & Sharpe's universal milling machine,

Plain rod tire gauges are made for each size of tire, and all wheel centres are made of exact standard sizes, so that the tire when bored out to the standard gauge will have the proper amount of shrinkage and will fit any wheel properly. In addition to the rod gauges, thickness gauges are used, giving the exact amount allowed for shrinkage for each size. We are informed that this method of securing the proper amount of shrinkage is so successful that tires never become loose until they have worn down to 1¾ in. or less in thickness. Loose tires are taken off and shrunk on again, a thin shim or tin liner being interposed.

The pressure gauges are tested on a special machine against a standard gauge. The machine is actuated by a screw and hand-wheel. The necessity of frequently testing the accuracy of locomotive pressure gauges has often been urged in the columns of the *Gazette*.

The shop drawings are blue prints mounted on boards no larger than the blue print. These boards are brass-bound at the corners, and are kept in a rack near the foreman's office. Each division in the rack is numbered, and an index shows in what division any drawing may be found. The divisions are vertical, so that the shop drawings stand on their edges. Any workman may consult a drawing here, but must obtain leave of the assistant foreman before he can take it away.

A neat, portable machine is used for truing to the lathe centres. It is in charge of one man, who goes round the machines generally, truing each lathe centre about once a week. The machine can be clamped to the slide, and the power is taken from the face-plate or the cone pullies of the lathe through a cord driving gear.

The back of the links are not machined but are left black, any rough scale being removed by the emery wheel before hardening. The links are ground true on the working faces by emery wheels mounted on vertical spindles. These spindles work through a horizontal levelling table on which the links are laid while being ground. They must then be ground square. Most of the links are made in two halves, back and front, but solid links can be easily ground by using a small wheel. All links are trued up against a standard dummy link so that they are all alike.

A fine Sellers planing machine with two tool boxes and a 25-ft. table is used for heavy planing. Four cylinders or 32 driving axle boxes can be planed at one time. The crowns of the boxes are not slotted for the brasses, as usual, but are planed inside to the proper radius for the brasses by means of an ingenious tool-holder which can be fixed to the ordinary tool-box of the planer. While in slotting but one box can be operated on at a time, a whole string of boxes can be laid on the planing machine platen and planed simultaneously. The consequent saving of time is considerable and, of course, every box planed at the same setting must be alike, and consequently interchangeability is more easily obtained.

The brasses are bored in an old cylinder boring machine. The box is clamped in a fixed pedestal on the bed of the machine, and must, therefore, be bored true, and as the work requires no setting, it can be very cheaply performed and requires no special skill. Fourteen boxes can be bored in ten hours at a cost of 12½ cents each.

The brasses are forced into the boxes by means of an hydraulic press made at Aurora. This press is of very ingenious and simple design, and as it is capable of exerting a pressure of 90 tons, it is very useful for a variety of operations, pressing in coupling bushes, straightening, etc. The pressure can be varied and the motion of the ram stopped and reversed with great ease by means of a small handle working a controlling valve. The pump is worked by a long pitman driven by a wrist-pin in a disk attached to the end of a countershaft above.

Bushed end coupling rods are used and are much liked. Not only are they more easily repaired than the strap rod, but the wear appears to be much less. The rods are made of the I section.

Nuts are shaped by means of revolving cutters having a traversing motion, on the same principle as a slot-drill.

Cylinder ports are milled by means of an attachment to an ordinary swing drill. A template of the proper form is placed over the valve, and insures the ports being made of the right size and in correct position. One port can be milled in 20 minutes.

THE SEASONING OF LUMBER.

The testing room and laboratory at Aurora are unusually complete and have done a great deal of work in ascertaining both the chemical composition and mechanical properties of the great variety of articles used on a railroad. Some novel and interesting tests have lately been made to ascertain some facts as to the seasoning of timber. The term "well seasoned lumber" is used in most specifications for cars and other work, but what does it mean? Where can we draw the line between well and imperfectly seasoned timber? It is affirmed by some and denied by others that timber can be seasoned during the winter months. Disputes consequently frequently arise between contractor and railroad officers, the latter contending that the timber used in cars is damp, while the makers assert that having been lying in their yard from November to May, the timber is properly seasoned.

Mr. Rhodes, the Superintendent of Motive Power, determined, in order to solve the question, to ascertain the exact amount of moisture that timber contained at regular intervals during the seasoning process. The result of his investigations is, broadly, that during the winter the timber loses none of its original moisture, and that timber that is wet in November still contains the same amount of moisture in April. The percentage of water in the timber then diminishes month after month until the timber, as judged by the ordinary tests of feel and appearance, is sufficiently dry to be called seasoned.

It is somewhat singular that no data exist in printed form (as far as can be ascertained) as to the amount of moisture in different kinds of timber. A great many writers have recorded the results of their investigations into the strength, quality and durability of an immense variety of timbers from all climes, but apparently none have stated what percentage of moisture is found in any given timber when freshly cut and how much when thoroughly seasoned. The experiments made at Aurora by Mr. Rhodes have ended this uncertainty, and he can now say that any particular timber used in car building cannot be considered as seasoned if it contains more than a given percentage of moisture. In fact, he is now able to define precisely what is seasoned and is unseasoned lumber.

LABORATORY.

The laboratory is in charge of Mr. Brown, an experienced analytical chemist, who, aided by three assistants, analyzes nearly all the varied products that go under the general name of railroad supplies. Even such articles as ink and soap have to endure a searching investigation, while every source of water supply along the road is receiving systematic attention. The water is, of course, analyzed specially with a view to ascertain its suitability for use in locomotive boilers. The total amount of incrusting or scale-forming matter in each source of supply is ascertained. The principal results given by the water used by locomotives on the Chicago and St. Louis divisions respectively are given below, the results obtained from other well-known sources of supply being added in order to make a comparison. The water of Loch Katrine, Scotland, from which Glasgow derives its supply, is about the purest and softest known.

WATER SUPPLY—CHICAGO, BURLINGTON & QUINCY RAILROAD.

	1.	2.	3.	4.
Chicago Division—				
Best	10.666	1.365	4.19	1.5
Worst	28.851	10.788	11.33	3.9
Average	16.405	2.853	6.44	2.2
St. Louis Division—				
Best	4.898	1.458	1.92	0.7
Worst	20.178	2.449	7.93	2.8
Average	11.490	1.678	4.51	1 6
Lake Michigan	7.305	.626	2.87	1.0
Hudson River	7.177	1.136	2.82	1.0
Croton River, N. Y.	5.362	1.511	2.11	0.7
Loch Katrine, Scotland	0.911	1.333	.36	0.1

NOTES.—1. This column gives total quantity of incrusting solids (including silica, oxide of iron and alumina, carbonates of lime and magnesia, and sulphates of lime and magnesia) in grains per gallon.

2. Grains of non-crusting solids, chiefly alkalies, per gallon.

3. Pounds of incrusting matter per standard tank of 2,750 gallons.

4. Comparative quantity of incrusting matter, Lake Michigan being taken as unity.

The third column giving the weight in pounds of incrusting matter per tender tank is very instructive, and shows the large amount of incrustation that may be expected to be left in a locomotive boiler. The non-incrusting matter may be partly deposited as mud and partly mechanically combined with the scale. According to this table, an engine consuming three full tanks of water per day, would in a week's work with the average water in the Chicago Division accumulate, at least, 116 lbs. of incrustation. With the best water on the St. Louis division (taken from the Mississippi at Rock Island) the result of a similar week's work would be only 34½ lbs. of incrustation. The difference shows the importance of good water.

The incrustation found in the boilers is often analyzed, and when the locomotive is known to have been supplied from one particular source, the analysis is compared with that of the water. The results generally agree very closely, the scale having the composition that might be expected from the character of the incrusting matter found in the water supply

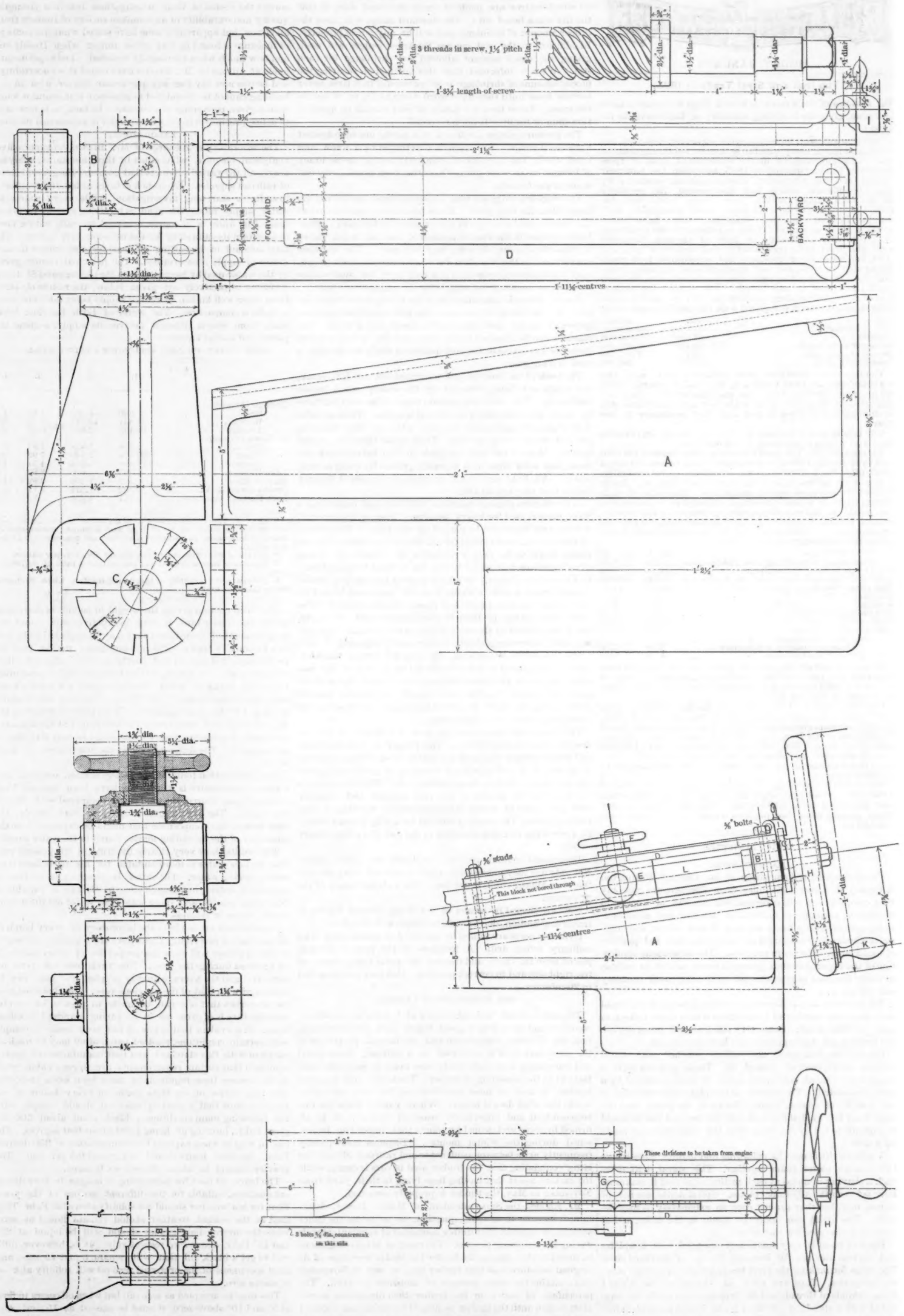
The results show very clearly the truth of the general rule that surface water is more suitable for use in boilers than well or spring water. The latter is generally more free of suspended matter, but though clear to the eye, is capable of depositing considerably more scale than water obtained from ponds, rivers or streams.

Careful tests are made in the laboratory of every batch of oil and tallow received. These tests are regularly recorded, so that a glance will show the properties of every batch of oil received during the year. The variations are very instructive, and the average quality supplied one year can be compared with that of the previous year. The knowledge of the properties that oils can be made to possess by careful manufacture is of great use in preparing standard specifications. It is evident that if one oil has been made to comply with certain conditions, another batch of oil may be made to conform with this standard, and that manufacturers cannot complain that certain requirements are unreasonable, when in other cases these requirements have been even exceeded. The long series of oil tests made on every batch of oil received show that a good cylinder oil should comply with the following main conditions: Flash point about 500 degrees Fahr., burning or firing point about 600 degrees. The loss in weight when exposed to a temperature of 350 degrees Fahr. for three hours should not exceed 0.5 per cent. The gravity should be about 26 degrees Beaume.

The black oil used for lubricating is bought in four different qualities, suitable for the different seasons of the year. That for hot weather should not solidify above 55° Fahr. That used in the coldest weather should remain liquid at zero, while the intermediate grades should still be liquid at 25° and 15° Fahr. above zero respectively. It is, however, difficult to get a black oil that will remain liquid at zero, and most specimens of the professed zero oil will solidify at 2° or 5° above zero.

This may be accepted as zero oil, but when oil ceases to flow at 8° and 10° above zero, it must be classed as 15° oil, and paid for accordingly. The flash point of all these oils is about 300° Fahr. and the burning point about 400° Fahr.

It is well known that tallow as used in steam engines for



SCREW REVERSING GEAR FOR LOCOMOTIVES,

Grand Trunk Railway, Great Western Division.

lubricating purposes should contain the minimum of free fatty acid. If this be present, a sort of galvanic action is set up in the steam chest, and the iron suffers, corroding very rapidly. Some tallows contain as much as 50 or 60 per cent. of acid, but when properly manufactured for locomotive purposes, contains only from to $\frac{1}{4}\frac{1}{0}$ per cent. of free fatty acid. The importance of carefully testing every batch of tallow is thus very clearly shown.

Kerosene is subjected to a fire test in a closed vessel, and the two grades used give results of 110° and 120° Fahr. respectively.

A number of very interesting tests are in progress as regards different kinds of soap, and some very instructive results have been arrived at. Some soaps contain a very small proportion of saponaceous matter, the greater part of the weight of the soap being in some cases water, and in others sand and various foreign substances. When the price of the soap is worked out per lb. of saponaceous matter, some extraordinary results are found. The soap which is the cheapest per barrel is often found to be the dearest per lb. of real soap. Standard specifications are in use on the Chicago, Burlington & Quincy giving the percentage of saponaceous matter, water, and free alkali, which soaps for different purposes should contain. That used for washing trucks may contain considerable free alkali, while one quality used for washing the bodies of cars contains a very minute quantity, so as not to injure the paint. A second quality used for the same purpose, but designed to cut into and remove dirt which the first soap cannot touch, has more free alkali.

The laboratory certainly develops some remarkable variations in the composition of different soaps, and those who have some difficulty in procuring reliable qualities of this article would find much information in the results obtained at Aurora.

Even manufacturers might often learn something from a visit to the laboratory, as experience shows that they are often ignorant of the real composition of the articles they deal in. Shortly before our visit, a sample of white lead was sent for analysis, the maker stating that he knew it was a particularly good article of its kind. On analysis, it was found to contain only about 25 per cent. of white lead, and was adulterated with barytes, zinc and sand to an unusual extent. The sample was sent specially for analysis, and, therefore, shows that the person who ought to know all about it was really quite ignorant of the real composition of what he believed to be a good and pure article.

MECHANICAL TEST ROOM.

The mechanical test room adjoins the laboratory and contains two machines, one capable of exerting a strain of 75,000 lbs., and the other of 200,000 lbs. Bridge rods, rails, etc., are tested here, as well as locomotive and car work.

Some experiments have been made lately with different methods of connecting the draw-springs to the draw-heads, in order to ascertain which arrangement gives the greatest strength. The Potter draw-bar used gives a breaking strain in tension of from 125,000 to 163,000 lbs. The ordinary coupling links used break at 120,000 to 130,000 lbs. tensile strain. Links of good quality stretch from $\frac{8}{1}\frac{}{0}$ in. to $\frac{13}{16}$ in. in 9 in., and generally break opposite the weld.

A long series of combined tests, both chemical and mechanical, have been made of steel rails in order to determine the exact chemical composition which gives the best results in wear, but the results are not yet complete. Many singular paradoxes are met with, the chemical composition of a very bad and of a very good steel rail being found to be identical. The quality of a steel rail is evidently determined by many subtle influences, and apparently is not wholly dependent on chemical composition. The method of rolling has, of course, much influence on the life of the rail, and the form again has much to do with successful rolling.

A Thurston oil testing machine is used for ascertaining the lubricating properties of different oils. In order to obtain accurate results, it is found that excessive care is necessary to wipe the surfaces perfectly clean before use and guard in every way against the access of dust. Unless this is done, very different results will be given by the same sample of oil. A stronger illustration of the importance of a good dust guard in an axle box could hardly be found.

The Park Electric Freight Train Brake.

A trial of the Park Electric Brake took place on Dec. 30 on the Chicago, Burlington & Quincy Railroad at Burlington, Ia. The tests were made over the track on which the elaborate series of experiments on freight train brakes were made last summer.

The brakes tried on that occasion were all well known by name, and with one or two possible exceptions, had been largely used in practical service for some years. The Park Electric Brake is, on the other hand, little known even by name, and has not been hitherto used in practical every-day working, either with freight or passenger trains. The inventor had, therefore, little experience as to the actual merits of his brake, and the trials may be regarded as merely preliminary to the competitive trials to be held at Burlington in April, when thorough tests will be made of the working of many well known freight train brakes which will embody all the latest improvements suggested by extended practical use and elaborate analytical experiments.

The trial of the Park Electric Brake was therefore of a preliminary and informal character. The trials were attended by two members of the Committee of the Master Car-Builders' Association on Freight Train Brakes, the chairman, Mr. Godfrey W. Rhodes, and Mr. D. H. Neale. Mr. Stewart, Division Superintendent, and Mr. West, Master Mechanic, Chicago, Burlington & Quincy, were also present, while the records of the trial were taken by Messrs. Herr and Sargent of the Motive Power department.

The brake was applied to a train of 25 stock cars equipped with the Westinghouse Automatic freight brake, the electric brake being arranged to use the same foundation brake work, levers, etc. During the trial, the Westinghouse brake was cut out, and was, therefore, inoperative. In addition to the 25 stock cars (which were empty), a dynamometer car and an eight-wheeled way car were attached to the train. The electric brake was not applied to these latter cars, or to the engine and tender. During the trials the Westinghouse driver brake was used on the engine, and a power brake, either the Electric or the Westinghouse driver was used on about 67 per cent. of the total weight of engine, tender and train. The total length of the engine, tender and train was about 1035 ft. and the total weight may be taken at about 775,000 lbs.

The construction of the brake may be briefly described as follows:

A dynamo is placed on the locomotive and is driven by a small independent engine. The whole affair is easily detached from the locomotive and weighs about 400 lbs. Three wires run the length of the train, and at each end of each car are coupled together by a very simple device, one coupling serving for the three wires. The brake is non-automatic, or in other words, does not apply in case of a break-away, but it is proposed to add a storage reservoir in the way car at the rear end of the train, whereby the conductor could apply the brake in case of the train parting. As, however, applied to the trial train, the brake is non-automatic, and the current only runs through the wires when the brakes are being applied or released from the engine. Normally, when the train is running or standing with the brakes off, there is no current in the wires.

The engineer applies and releases the brakes by moving a lever on an electric switch board on the engine. The current applying the brakes runs to the end of the train through one wire and returns through the centre wire of the three used. When the lever on the switch board is moved to the release position the current runs through the third wire, releasing the brakes, and returns through the centre wire as before. Whenever the coupling at the end of the train is pulled apart, the wires automatically make the proper connection in the coupling, so that the current when applied will make a circuit the length of the train and through the centre wire. It will thus be seen that the couplings require little attention. They are very easily coupled by a single operation, and the coupling at the end of the train is simply allowed to hang loose, and does not require to be placed in a rest or closed with a plug or a stop-cock or any similar contrivance.

The means by which the electric current applies the brake shoes on each car are decidedly open to criticism, but will be probably largely modified in the near future. As now arranged, an eccentric is mounted on one axle of each car. The end of the eccentric rod can by means of pawls be made to engage in ratchet teeth on the periphery of a cast-iron drum carried on the under side of the middle sills of the car. This drum also carries a chain which is attached to the brake and levers in the usual manner. The passage of an electric current along the train causes the pawls worked by the eccentric rod to engage the drum, which consequently rotates and winds up the chain applying the brake shoes. A second pawl prevents the drum running back when the pawl driven by the eccentric rod is moving back to take a fresh stroke. When the current applying the brake is stopped (by the lever or the switch board being thrown into the middle or neutral position), the applying pawl ceases to act, but the second pawl retains the brake on. When the releasing current is passed through the other wire, this second pawl is thrown out of gear, and the brakes come off. As the details will probably be considerably modified, the above brief and somewhat imperfect description will suffice; but it may be noted that an eccentric constantly running on a car axle is very objectionable, and that the teeth of the ratchet would be liable to be filled up with ice, snow and mud, rendering the brake inoperative.

As the brake is applied by a few revolutions of the wheel, the shoes are full on in a very short space of time, and must be applied simultaneously throughout the length of a train however long. Assuming that the brake shoes are fully applied in four revolutions of a wheel, it follows that the brake will be fully on when the train has run 35 feet. At 40 miles per hour this distance would be run in little over one half of a second. As the freight train brakes tried at Burlington last summer required from 10 seconds to 30 seconds to fully apply the brake on a freight train of 25 cars the difference is very conspicuous.

The Park brake can be adjusted so as not to slide the wheels. When the brake is applied with what is deemed sufficient force, a small set-screw forms a contact, and shunts the current that holds the pawl applying the brakes. This pawl then drops, and the brake-chain drum is no longer revolved. The brake therefore continues to be applied with the proper maximum amount of force and is not released, the drum being prevented from running back by the second or retaining pawl already described. This pawl can only be lifted by the releasing current or by hand.

The following were the results of the different tests:

Speed. Miles per hour.	Distance. Feet.	Equivalent distance at 40 miles per hour.	Grade. Ft. per mile.
13	132	1,248	Level
20½	462	1,760	Level
21	440	1,597	53 ft.
31	1,090	1,814	Level
38	4,664	.....	53 ft.

The distances and speed were accurately determined by the recording apparatus on the Chicago, Burlington & Quincy dynamometer car. In the last stop the electric brake acted very imperfectly and the records given by the apparatus in the dynamometer car show that most of the braking must have been done by the engine and tender. The pawls were probably unable to act at the speed, which was very high for a freight train. The other stops were, however, very good performances and in point of distance compare very favorably with the results given by any other freight train brake. As the electric brake is new and hitherto untested, it is highly probable that these results can be considerably improved on in future tests.

The third column in our table gives the distance in which the train would have been stopped under similar circumstances had the speed been 40 miles per hour, the distance being supposed to vary exactly as the square of the speed. This assumption is not strictly correct, but the last column serves to show that the brake does best at low speeds. This is probably due to some defective action of the pawls at a high speed, and it is quite possible that it will disappear with improvements in the mechanical details of the brake.

The most remarkable point about the trial was the entire absence of any shock during the stops. The "slidometer" used during the Burlington trials last summer was in position in the way car, but it never moved a hair's breadth during the entire trials. Those riding in this car at the rear of the train could just feel the brake applied, the speed then gradually decreased without any jar or shock until the train came to a stand. Even the inevitable rebound when motion is finally arrested was very slight, and in some stops hardly perceptible.

Throughout the entire tests nothing about the cars was broken or displaced, a strong contrast to the long array of links, pins, draw-heads, centre plates, etc., broken at the Burlington tests. The trial of the electric brake may be taken as proving that the simultaneous and instantaneous action of a brake throughout a train will enable it to be brought to a stand without the slightest shock, even though loose couplings are used. The cars in these trials were fitted with the Potter draw-bar, with the usual links and pins.

The trial showed that the brake chains used on the drum were too weak, several being broken. The insulation of the wire conveying the releasing current was defective, and several of the brakes had to be released by hand. These defects of detail can, however, be easily remedied, and were caused by the hasty manner in which the brake was fitted up

The brake appears to possess the advantages of lightness and cheapness of first cost. As no india-rubber or other perishable material is used, the repairs should not be expensive when experience has shown the proper proportions of the parts necessary to insure sufficient strength.

Altogether the trial is very interesting and instructive, and distinctly adds to our knowledge as to electric brakes. When we reflect that freight-train brakes that have been in extensive use for many years are unable to make an emergency stop without causing serious damage to cars and lading, it is somewhat startling to find that a new comer steps in, and, without any previous experience, stops a long train as smoothly as the most fastidious old lady passenger could desire.

For comparison with the above, we add the following tables of best stops from 40 miles per hour on a level, made at Burlington tests in July, 1886, with 25-car trains:

Brake designation.	Actual speed, miles per hour.	Distance run in feet after applying air.	Time to stop in seconds after applying air.
Westinghouse automatic.	40	977	25½
American buffer.....	38.7	1,633	50½
Eames automatic vacuum.....	39	1,477	43¾

Screw Reversing Gear.

The accompanying illustrations represent a form of reversing gear used on the Great Western Division of the Grand Trunk. The end of the reach-rod is carried by a gudgeon threaded by the screw. The gudgeon slides between two faces, which prevent it from revolving when the screw is turned. The upper side of the cast-iron bracket carrying the screw forms a face on which the lower side of the gudgeon slides, and a loose slotted piece is bolted to this frame and assists in keeping the gudgeon in proper position. The upper surface of this piece is graduated, and the position of an index carried by the gudgeon shows the gear in which the engine is worked. It can be clamped in any position by means of a fine thread screw with a milled head, and it can be locked in certain positions by means of a trigger, which engages in notches in a wheel fast on the screw, and placed just inside the hand wheel. This gear is much liked as it is easily worked, and the valve gear can be very finely graduated. An engine cannot, of course, be so quickly reversed as with a lever, but as the engines all have either steam or air-brakes, the reverse lever is now seldom used for stopping.

The hand wheel is cast-iron, and the handle is wrought iron turned and rivetted in place.

The Abt System of Railway for Steep Inclines.

[A paper read before the American Society of Civil Engineers by the late Walton W. Evans, C. E., and his last considerable work.]

The problem of how to climb steep inclines on railways in the best and most economical way, has taxed the inventive powers and exercised the brains of many and clever engineers. A third of a century or more ago, almost all of the important valleys of the civilized world had been occupied by railways depending on weight and the adhesion of smooth surfaces as the chief elements of traction in moving railway trains. As the engine began to mount inclines, and as there was an ever-increasing desire to haul heavier trains, the locomotive was enlarged in all its capacities and made more ponderous. The rail had to grow in weight and size to be able to carry the locomotive and perform its part of the duty, and excellent as have been the results on easier gradients in the reduction of cost of transportation, when we come to steeper inclines the service fails in

an alarmingly rapid degree. There the locomotive with its five pairs of wheels coupled and a total weight of 144,000 lbs., having 128,000 lbs. on the driving-wheels, has become a perfect giant. Yet a giant who is chiefly seen wrestling with his own stupendous mass is a sore exhibit of impotence, and this brings us to a point where we may with propriety say, "Stop, we can go no further."

The writer has studied the inventions and improvements of Mr. Roman Abt, of Switzerland, and believes that he has done a great deal towards solving the problem we are interested in, and by so doing he has opened new fields for railway enterprise.

HISTORICAL REVIEW.

When Trevithick, in 1804, had succeeded in building the first locomotive engine that ever pulled a train of loaded cars, an event that took place on the Merthyr Tydvil Railway in South Wales, he relied merely on the adhesion between his smooth driving-wheels and smooth rails for obtaining the requisite traction. His locomotive being light, the tractive power appeared to be very small, and yet the engine weight was more than the cast iron tram-plates of those days could stand. Instead of grasping the proper remedies of greater engine weight combined with stronger rails—those remedies which led to the wonderful developments of later years—Trevithick, partly also because called away by other interests, gave up all further attempts to improve upon his locomotive, and expressed the conviction that nothing but some additional means of propulsion could yield satisfactory results.*

A suggestion like this, coming from so prominent an engineer as Trevithick, did not fail to shape the course of inventive genius for the following years. But nothing of a practical nature was developed until, in 1811, Blenkinsop obtained an English patent for the application of a rack laid all along the line of a railway, with a corresponding driving-pinion on the locomotive. This plan was at once executed on a railway leading from Leeds, in England, to the Middleton Coal Pits. The opening of the line occurred Aug. 12, 1812, and though rack and engine were of an extremely primitive construction, yet this mode of operation remained in use for over twenty years in the transportation of coals from the Middleton Pits to Leeds. The pinion alone furnished the traction, and the engine worked on gradients of 1 in 15. Here, then, appears for the first time an effective means for operating heavy inclines by locomotive power. The action of the pinion in the rack is positive, and the amount of traction is limited only by the dimensions of rack and pinion, and is practically independent of the engine weight.

Fruitful as this idea would have seemed to be, and not withstanding the fact that the light locomotives of the earlier railroad era excluded any economic operation of steeper gradients, the rack and pinion found no friends in its immediate adaptation to the regular railway system. The lines were universally developed with easy gradients—even Stephenson himself thought that the economical limit was reached with a gradient of 1 in 200, a limit which De Pambour later on extended to 1 in 100, and whenever a sudden rise or steeper gradients were encountered, they were overcome by means of ropes and stationary engines, much in the fashion that inclined planes in coal pits had already been worked for a long time. These inclined rope sections once formed a prominent feature on many an important railway in Europe, as well as in the United States; but one by one they were adapted to regular locomotive service, and with perhaps some few exceptions, on roads of secondary importance, they have long since become a mere matter of history. Inconvenience and expense have sealed their fates.

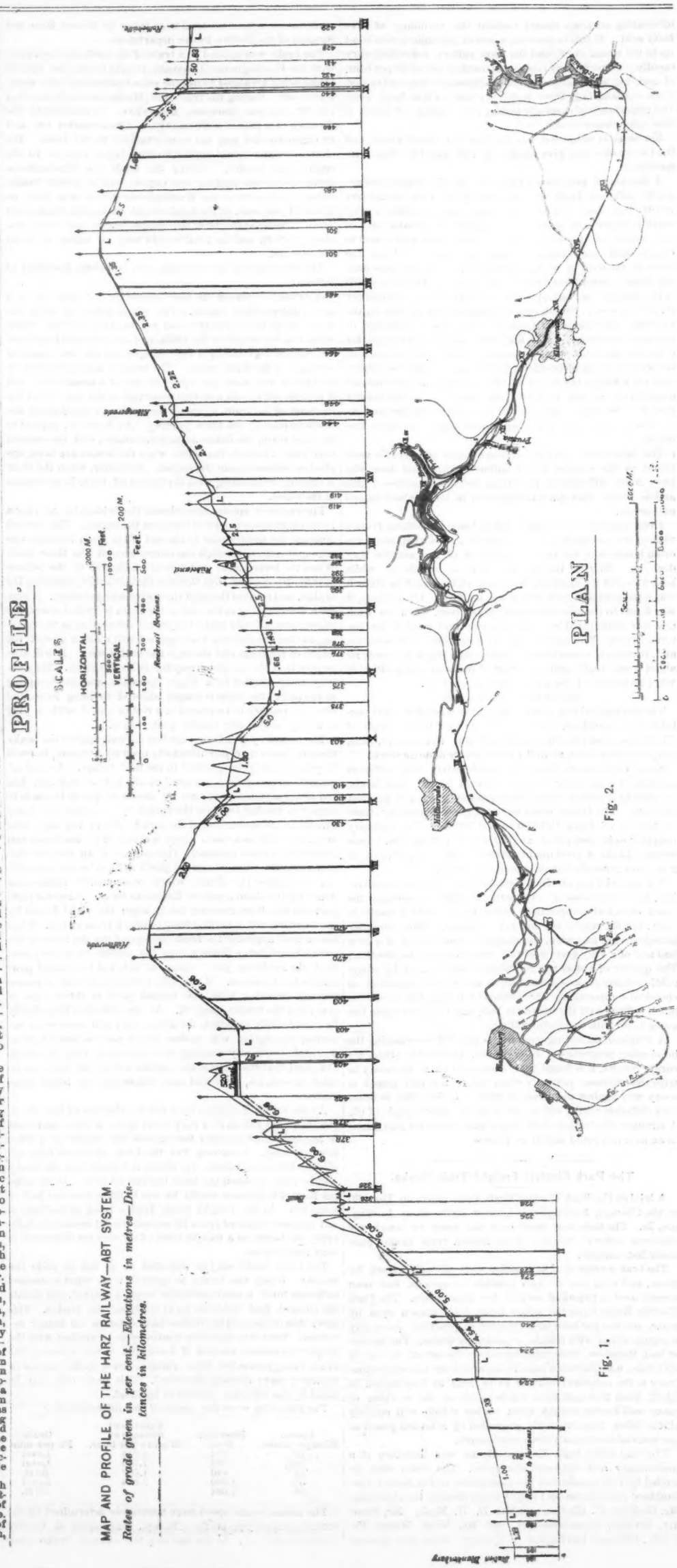
The so-called atmospheric railways formed a curious phase in the struggle for supremacy among the means of transportation. They took practical shape during the interval from 1840 to 1848, and occupied the closest attention of prominent engineers. Millions were spent in England and France in the perfection of these schemes, and millions and schemes disappeared together. It had been expected that this mode of propulsion would be of special use in the operation of steep inclines, and it therefore deserves a passing mention.

In 1847, a bold attempt was made in our country to adapt the rack and pinion to the requirements of a regular railway line. The experiment took place on an inclined plane of 1 in 17 of the Madison & Indianapolis Railroad.† Besides the regular adhesion devices, the locomotive was provided with an independent and seperately working steam engine for driving the pinion mechanism. Both adhesion and pinion worked simultaneously and assisted each other, and this co-operation constituted a signal advance over the original arrangement of Blenkinsop. But there was no end of repairs to the cast iron rack, and these expensive repairs, and a somewhat defective design of the engines, led, in the natural course of things, as elsewhere, to ordinary locomotive service. As long as a cast iron rack-rail had to be employed, this system had no possible chance for any larger applications, and with the state of the arts in those days, it was bound to fail. Everywhere adhesion was made to do the service as best it could.

Almost simultaneously with this described effort on the Madison & Indianapolis Railroad, George Escol Sellers, of Cincinnati, appeared with a plan for working inclines by laying a smooth centre-rail, and by supplying the regular locomotive with a pair of horizontal friction rollers, pressing against the centre-rail, and being operated by a special set of cylinders. These friction rollers were to produce an additional tractive power sufficient to overcome very steep inclines. The proposition of a centre-rail and horizontal friction wheels as a means to increase traction had already been made by Vignolles and Ericsson, previous to the historic competition on the Liverpool & Manchester Railway, but George Escol Sellers appears to have been the first one to distinctly propose the use of a smooth centre-rail for climbing steep gradients. His plan, as laid down in a comprehensive and very lucid pamphlet, published in Cincinnati in 1849, contains many very ingenious suggestions and details, among which may be mentioned the clever manner by which the resistance of the train was made to create the requisite pressure of the friction wheels against the centre-rail. Mr. Sellers had a working model built, which was first exhibited in Cincinnati, and subsequently in New York in 1848. When, stimulated by the all-exciting gold discoveries in California, the construction of the Panama Railway was decided upon, the first surveys led to gradients for which the ordinary

* Richard Trevithick, the engineer referred to in the first part of this paper, having made for himself a fine reputation in the matter of steam pumps, dropped railways, and, on being invited to Peru, went there. He succeeded in pumping the water from some rich mines that had been for a long time flooded. The delight of the owners and the enthusiasm of the Viceroy were so great, that a statue of solid silver was ordered to be erected to him in the Plaza of Lima. Not having seen anything of the kind there, the writer asked what had become of the statue, and was amazed to find that not one of the "Hidalgos" of that once famous city had ever heard of the statue or of Trevithick either. It must be recollected in connection with this, that Trevithick was in Peru in the second decade of this century, not such a long time ago.

† A full account of the inclined plane near Indianapolis, with descriptions of the rack-rail, and of various locomotives and attachments used in connection with it, and also of the final use of the same plane by a gravity locomotive, is given in paper No. 158, by M. J. Becker, M. Am. Soc. C. E., in the Transactions of the American Society of Civil Engineers, Vol. VI., page 68 (March, 1878).



MAP AND PROFILE OF THE HARZ RAILWAY—ABT SYSTEM.
Rates of grade given in per cent.—Elevations in metres—Distances in kilometres.

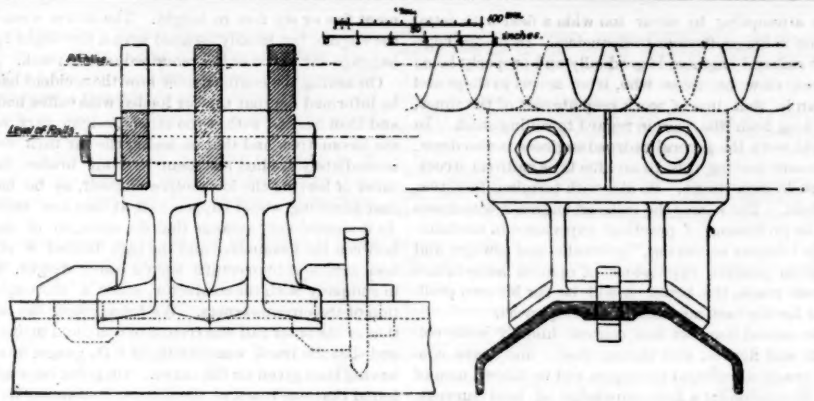


Fig. 4. Fig. 5.

Rack Rail and Chair.—Abt System.

Fig. 3.—Rack Bar—Abt System.

means of locomotion appeared to be insufficient. This gave a chance for a practical demonstration of Mr. Sellers' plan on a grand scale, and the first engines for the Panama Railway were actually ordered and built upon his system. In the meantime, however, and before these locomotives arrived at the Isthmus, the present line, with comparatively light gradients, had been discovered. The horizontal adhesion mechanism became superfluous, and the engines were worked without it.*

The year 1851 was one of special interest in the eventful development of the iron horse. It was the year in which the great competitive trial took place on the Semmering Railway in the Noric Alps of Austria, which was to decide on the best type of adhesion engine to work that difficult line, with its extensive gradients of 1 in 45, 1 in 42, 1 in 40, and with its numerous curves. None of the competing locomotives answered satisfactorily in the subsequent regular service, and this was productive for several years of many projects in locomotive construction for working steep gradients. Among these we notice the first appearance of the *double bogie engine* by Cockerill, in Seraing, Belgium, which, in very recent years, flashed up again into an ephemeral existence. We also recognize here Sellers' centre-rail and mechanism in a proposition by Krauss, but all these plans found no favor, and had to give way to the *Engerth type* of locomotives, and its gradual transformation into the improved eight-couplers of our present day.

Once more we meet the centre-rail of Sellers, when Fell, in 1867, applied it practically in his railway across the Mont Cenis. That line had an average gradient of 1 in 25.6, with maximum gradients of 1 in 12. It remained in actual operation until the tunnel was opened to traffic. This formed the last practical attempt with a smooth centre-rail. The engine was rather complicated. The tractive power depended entirely upon the adhesion of smooth surfaces, and varied thus with the state of the weather and the conditions of the track.

But while Fell was busily engaged laying his centre-rail across the Alps, Sylvester Marsh, in this country, was at work running a line with a centre rack-rail to the top of Mount Washington.† There could be no doubt as to the steepness of this road, its average gradient being about 1 in 4.1, with a maximum gradient of 1 in 2.67. The ground was first broken in the summer of 1866. With this Mount Washington Railway, the rack-rail system of Blenkinsop entered into a new era of development, and this was essentially due to the improvements in the rack itself. Cast iron, with its low limit of strength and its unreliable qualities, was abandoned, and wrought iron was used in its stead for the first time. The change in the material necessitated a change in the form. The rack took the shape of a ladder, the sides being formed by angle-irons, and the rounds being the teeth or cogs, which were made of round iron. This railway was completely finished in 1869, and since then, up to the present hour, for a period of over 15 years, it has safely conveyed thousands of tourists to the lofty summit of Mount Washington without the loss of a life.

The first sections of the wrought iron rack had hardly been laid at Mount Washington, when tidings of what Marsh was doing in America reached Switzerland, that world-famed mountain region par excellence. Shut in by, and at the same separating, the leading commercial countries of the European continent, Switzerland had always been greatly benefited by the international traffic across its snow-capped mountain ranges. Keenly awake to this fact, she had always jealously watched her interests, and with the demands of growing trade, the bridle-paths and the mule caravans of a by-gone age gave way to magnificent road structures with the modern freight wagon and the stately post coach. The roads over the Splugen, the Bernhardin, the Lukmanier, the St. Gothard and the Simplon, are masterpieces in the art of road-making, and the boldness of some of their parts will always excite the wonder and the admiration of the traveler. But just then the public mind was in a state of growing excitement. The Brenner Pass in Austria, near to the eastern frontier of Switzerland, had just been opened to public traffic, and the whistle of the locomotive echoed and re-echoed merrily along the rocky line. Away down in the southwest, drilling machines were diligently at work in the heart of Mont Cenis, making the big hole, while Fell had the audacity to climb the mountain even during the construction of the tunnel. These were threatening clouds for the vested rights of the little republic, and something had to be done to avert the danger. Projects of all sorts for working steep gradients were freely discussed, and it was a well-timed thing that the Swiss representative in Washington should send to his government an official report of what Marsh was quietly doing in the White Mountains. This happened somewhere in 1867, or the early part of 1868. It was clear that a railroad had to cross the Swiss Alps and the St. Gothard Pass, on account of its central location, and notwithstanding its serious engineering problems, was the one most prominently discussed. In view of the prospective large traffic, and also of the shortcomings of regular adhesion service, it was not thought judicious to carry the gradients beyond 1 in 40, or thereabouts. But this was equivalent to an expensive development of the line and to a very long tunnel. It was in the autumn of 1868 that a proposition was made to adopt a ruling gradient of 1 in 20, and use the rack and pinion. This proposition came from N. Riggenbach, Master Mechanic of the Swiss Central Railway, conjointly with O. Zschokke, civil engineer. Though the adoption of the rack might have resulted in a saving of about one-third of the total cost of the road, yet the entire absence of practical experience on a line of this importance decided its rejection, and the St. Gothard was reserved for the adhesion locomotive.

The stone was rolling. The air was filled with enterprise, and if it would pay to run a railway up Mount Washington there would be ten-fold less risk in doing the same thing on the Rigi, that most renowned and most frequented elevation of the world. In the spring of 1869 an engineer left for America to prepare a minute professional report on Marsh's enterprise. The necessary capital for the Rigi Railway was soon afterwards secured and operations were commenced. Thus Riggenbach introduced the wrought-iron "ladder-rail" in Europe in his Vitznau-Rigi Railroad, which was opened in 1871. All the details of this line are nothing but modified copies of the Mount Washington road. Engine and rack-rail —the principal dimensions being retained—were built stronger, more substantial, and with more care throughout. The round teeth, however, of the original ladder-rack were here abandoned in favor of a trapezoidal tooth and the system of involute gearing. The maximum gradients on the Vitznau-Rigi road are 1 in 4, and, like the Mount Washington Railway, it is essentially a pleasure line, serving to convey tourists up and down the mountain sides.*

About the time that work was commenced on the Rigi Railway, Riggenbach started also to build a short line connecting the sandstone quarries of Ostermundingen (Berne) with an already existing adhesion line. The same wrought iron ladder rack was employed as on the Rigi enterprise, but in other respects there were essential differences. On the Rigi the rack-rail is laid throughout the entire length of the line; here, however, we find the line made up of rack-rail and of pure adhesion sections, the rack-rail being only used where the gradients required large traction. The maximum gradient is 1 in 10. The locomotives were of such a construction that either the pinion or the adhesion drivers could be thrown in or out of connection with the steam cylinders, and the train could thus be either propelled by adhesion alone, or by the pinion and rack alone, according to the gradients of the road. This line has remained in successful operation to the present day, and, excepting the short-lived attempt on the Madison & Indianapolis Railroad, we have here the first instance of a practical combination of the rack-rail with pure adhesion portions.

The immense financial success of the Rigi Railway, together with the fact that thousands upon thousands from all parts of the civilized world assisted every year to spread the fame of that remarkable spectacle of the puffing locomotive on the mountain side, soon led to the construction of other rack-railroads. The Mount Washington road had given the first impulse, the Rigi did the advertising, and the line to the quarries of Ostermundingen pointed the way to every-day applications. The total aggregate of the lengths of rack-railways laid in Europe alone up to the present time is about 28 miles, but it must be remembered that the Mount Washington line, which only has a length of 2.8 miles, if built with a uniform gradient of 1 in 40 would be over 27 miles in length, and would have to be run at 29 miles an hour to be the equivalent in time of the Mount Washington Railway at 3 miles an hour. The following is an enumeration of the lines thus far built, all of them being still in regular operation.

RAILWAYS WITH RACK-RAIL LAID OVER THE ENTIRE LINE.

	Constructed.	Max. gradient.		Radius of curves.
				Feet.
Mt. Washington, New Hampshire	1866-69	1 in 2.67	37.5 p. c.	554
Vitznau-Rigi, Switzerland	1870	1 in 4	25 "	590
Kahlenberg-Vienna, Austria	1872	1 in 10	10 "	590
Schwabenberg-Pesth, Hungary	1872	1 in 10	10 "	590
Arth-Rigi, Switzerland	1874	1 in 4.8	20.8 "	590
Rio de Janeiro, Brazil	1882	1 in 6.7	15 "	
Drachenfels to the Rhine, Germany	1883	1 in 4.5	22.2 "	

RAILWAYS WITH RACK RAIL AND ADHESION SECTIONS COMBINED.

	Constructed.	Max. gradient.		Radius of curves.
				Feet.
Ostermundingen, Switzerland	1870	1 in 10	10 p. c.	790
Rorschach-Heiden, "	1874	1 in 11	9.1 "	395
Wasseralfingen, Germany	1876	1 in 12.5	8 "	345
Rüti, Switzerland	1877	1 in 10	10 "	
Lauten (Quarries), Berne, Switzerland	1878	1 in 16.7	6 "	345
Oberlahnstein, Germany	1880	1 in 10	10 "	

The railways with rack rail and adhesion sections combined as a rule are worked in the manner described with the Ostermundingen line, that is, the engine exerts traction either by adhesion or by the pinion alone; yet in several instances attempts have been made to utilize adhesion simultaneously in combination with the pinion by simply coupling the adhesion drivers with the pinion, and notwithstanding the grave practical objections which stand in the way of such an arrangement, locomotives of this type can still be found.

These lines gradually and unmistakably demonstrated not only the feasibility, but the great practical bearing of the rack rail for working steep gradients. They showed that inclines could be safely operated, which with any failure in the mechanism would of necessity lead to terrible catastrophes; but so reliable were the provisions against such a event, that the first accident has yet to be recorded. They also showed that sharp curves could be rounded with ease, and irrespective of the state of the weather, or of the conditions of the track, the maximum train weight could always be hauled over the line.

In the meantime work had been progressing on the long tunnel through the St. Gothard. The cost was greater than had been anticipated; and in 1876, when work was to be commenced on the approaches to either side of the tunnel, the company found itself in very straightened circumstances. Once more the application of the rack-rail and the adoption of steeper gradients was discussed, and this time with great seriousness. It was expected to finish the road with the means at hand. A plan was worked out. The project was warmly supported by several prominent continental engineers; but, though the feasibility of the system was acceded to in principle on all sides, no definite conclusion could be arrived at, and the subject was ultimately tabled on account of the resistance of the Italian delegates and a somewhat general reluctance to adopt the system in its then undeveloped state.

DEFECTS OF THE LADDER RACK-RAIL.

Following thus the historic developments of the means for working steep gradients, we have been able to see how, little by little, the rack-rail has established for itself a certain modern recognition—a recognition, too, which is founded upon stubborn facts furnished by experience. There can no longer be any doubt concerning the practicability of the rack as a mechanical device in all these applications; and wherever once introduced in its modern form it has kept its own ground, thus furnishing a proof of the economy of its use. Yet withal it must be recalled that the existing rack-railroads are of moderate extension, of moderate traffic, and are operated at moderate velocities only. When it really comes to the higher demands of a regular railroad service, we find that the ladder-rack of Sylvester Marsh has serious inherent defects which incapacitate it for such purposes, and for which defects the very form of the rack excludes all remedies. The prime requisite for a smooth and quiet motion in all gearing is uniformity of pitch; and the greater the velocities the more important is this uniformity. It is the recognition of this fact which has led to the elaborate gear-cutting and gear-milling tools of our days. But the very mode of manufacturing the ladder-rack, the punching of its sides, the riveting of teeth and sides, etc., introduces elements of error which, though small by direct measurement, become apparent at higher speeds. Then, also, the ladder-rack is built in sections of about 10 feet, so as to reduce the influence of expansion by temperature. Still that influence is there, and it exists at every joint in form of an unequal pitch. The velocity on the existing rack-railroads, and on the steeper gradients, is generally from 3¾ to 4¼ miles per hour. At 5 miles per hour, the operation of the pinion in the rack much resembles a sort of trip-hammer action; and every increase of speed tells in the rapid wear of the pinion, though made of the best of steel. With an inability to run at high speeds, the locomotive, though running slow on steep gradients, and working with its full boiler capacity, cannot run correspondingly faster on the rack-rail sections of easier gradients where the traction is less. The engine, therefore, is unable in such cases to exert its full power, and this involves loss of time and an increased cost of transportation.

In order that the motion of the pinion in the rack—even under the supposition of an absolutely uniform pitch—be free of blows or impacts, it is necessary that before one pair of teeth has gone out of contact, another pair must have come to fairly bear against each other. This important condition determines the size, *i. e.*, diameter, of the pinion for a given pitch. The size of the pitch again depends upon the kind of materials employed, the amount of traction, and the width of the teeth. In the present ladder rack the pitch is already as small as it possibly could be chosen, and still the necessary diameter of the pinion becomes so large, that, together with the low speed, the power from the steam cylinders has to be transmitted to the pinion by multiple gearing. But multiple gearing complicates the

*John L. Stephens, the projector and promotor of that line, counted on having to pass over a mountain range and encounter very severe gradients. No line had yet been run, nor had accurate levels been taken. At the close of 1848 the writer loaned him one of his assistants, James Baldwin, to run a line and take levels. It was Baldwin who discovered the present location, and the summit of the Panama Railway is known as Baldwin's summit to this day. On this very route Count Ferdinand De Lesseps is now vainly attempting to build a sea-level canal.

Sellers' engines were built for and were the first used on that railway, but they ran only as ordinary adhesion engines. It may be interesting to know that Sellers prosecuted the railway company for not building heavy gradients and using his system, and he actually got a judgment in his favor for $14,000. This information was given to the writer by that Nestor of American engineering, Horatio Allen, Hon. M. Am. Soc. C. E., who was consulting engineer to the Panama Railway Company. It may also be very interesting to the members of the society to know that there is still alive and in the possession of great physical and mental ability—now when the world is covered with railways and has taken on itself a new phase of its existence—a man who has walked with George Stephenson over the Liverpool and Manchester Railway during its construction. This man is Horatio Allen. It was he who gave steam and life to the first locomotive ever moved on the American continent; and the writer, your humble servant, had the honor to give steam and life to the first locomotive ever moved south of the equator.

†See descriptions of Mount Washington Railway, by Charles W. Copeland, M. Am. Soc. C. E., and Francis Collingwood, M. Am. Soc. C. E., in the Proceedings of the American Society of Civil Engineers, Vol. III., page 12 (February, 1877).

*Third.—In April, 1873, Dr. W. Poole, F. R. S., read a paper on the Rigi Railway of Switzerland before the Institution of Civil Engineers of England. In that paper he gives the entire credit of that railway and its peculiar track and rolling stock to Mr. Riggenbach as the inventor. He was not to blame, as he had (the writer has also) seen the words "Système Riggenbach" on the locomotives of that line and elsewhere. Knowing that a most elaborate and detailed report, with numerous graphic pen sketches of every part of the Mount Washington Railway had been made by a Swiss engineer (referred to in the preceding paper), and had been sent to Mr. Riggenbach, the writer saw clearly that Mr. Riggenbach was stealing the thunder that properly belonged to Mr. S. Marsh. The Swiss engineer, Herr Otto Grüninger, kindly consented to give the writer a translation from his German press copy of that report. Another copy the writer had made and bound as a book, to send to the Institution of Civil Engineers in London, where it is on record as evidence of what Mr. Marsh first did with a rack-rail in our time.

locomotive considerably; it introduces additional frictional losses; its renewal from time to time is expensive; and the additional rotating masses between the pinion and the elastic cushioning steam are not conducive to a soft action.

In the present ladder-rack the strains are also very high—especially so on the curves; in fact they are greater than what generally would be considered a safe working strain. A radical increase of traction, as the heavy traffic of a first-class regular line might demand, is altogether beyond the capacity of the ladder type. Considering the inequalities of pitch due to manufacture, and still more the discontinuity of the rack, its 10 ft. sections, and the chance of slight derangements, it becomes evident that an increase of traction by means of the direct coupling of two driving pinions is a thing utterly impossible. Any strengthening of the ladder-rack by an increase in the size of the pitch would only be creating most serious difficulties of another kind, recollecting what has been said about multiple gearing.

The ladder-rack has done well enough in its present sphere and under its present conditions, though even here suffering from its constitutional troubles; but when the imperous demands of an ever-progressing age are to be satisfied, then the ladder principle sadly fails. Its defects are inherent; they are of the blood and flesh of its form: and to free the sound and healthy rack principle from those drawbacks, and expand its usefulness, required the discovery of an entirely new type. This, we venture to say, has been admirably accomplished by Mr. Roman Abt. Mr. Abt has been for many years chief constructing engineer in Riggenbach's various rack enterprises. Many of the applications of the rack-rail in Europe were made under his immediate care, and, if any one has been able to thoroughly study and master the subject, he has. His new rack system embodies the experience of years in this class of engineering, and it is the writer's opinion that the rack, which thus far has been regarded more as a sort of makeshift, to be applied in extraordinary cases which required extraordinary means, has been advanced by him into a most important element in the planning of new roads, or in the economical operation of old ones.

ABT'S RACK-RAIL. (See figs. 3 to 5.)

In the construction of his new rack-rail, Mr. Abt has entirely abandoned the hopeless ladder-type, with its two sides and its rounds or teeth in between. His rack-rail consists essentially and is built up of a number of individual elementary racks (fig. 3) placed side by side. Each one of these elementary parts is nothing but a rack in the very simplest form, which is that of a bar of given length provided with teeth. Such an elementary rack will be able to stand a certain safe working strain, which is positively determined by the material, the dimensions of the bar and the pitch of the teeth. Whatever may be the traction to be developed by the pinion, by placing side by side a sufficient number of elementary bars, each one strained only to its chosen limit of working strain, we are able to meet any amount of traction as far as the strength of the rack-rail is concerned. These bars are connected among themselves by iron or steel chairs and bolts (Figs. 4 and 5). The chairs, which are placed at regular intervals, also keep the bars laterally distanced from each other, and through these chairs the whole is firmly bolted or otherwise secured to the wooden or iron ties of the road-bed.

The material of the bars may be either rolled iron, Bessemer steel, cast steel, or eventually also a good quality of steel castings, and the choice will be governed by convenience, or by the requirements of the road. With rolled bars the teeth may be produced in manifold ways, be it by punching, drilling, milling, sawing, pressure in dies, etc.; but no matter how produced, the last finishing touch ought to be always given by milling, which secures a perfect uniformity of pitch, the one important point to be aimed at. It guarantees a perfect contact between rack and pinion, and with the facilities of the modern machine shop its expense is no barrier to its application.

Mr. Abt lays the various bars, of which his rack-rail is composed, with broken joints. In this manner his rack-rail becomes practically one continuous structure, always one or more whole bars passing the joint of every two bars. Through this continuity of the rack-rail, and through the fastenings to the ties, a most desirable and important union is established between these two elements of the road, and still old ties may be exchanged for new ones without causing the slightest difficulty in the maintenance of the line. The breaking of the joints has the further advantage of equalizing throughout the influence of expansion by temperature. Comparing this with the ladder-type, with its discontinuous 10-feet sections, the advantages of Abt's rail with its continuous solidity and strength are very striking.

(TO BE CONTINUED.)

Contributions.

Specialties in Engineering.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your recent excellent articles on railroad location and on bridge specifications indirectly touch upon a subject that deserves more full acknowledgment by the profession and by the financial world, namely, specialties in engineering. Why is it that our lawyers, our physicians, are not merely permitted but expected to devote themselves to one particular branch, while the engineer is expected by the outside world to be proficient in all directions of engineering? He is supposed to have extensive knowledge of mathematics, physics, geology; to be completely proficient in land surveying, nautical surveying, high land surveying, topography; in sewage and hydraulic works; in railway surveys and locations, railway graduation, masonry and track; in common roads and pavements, bridge superstructures, terminal facilities, mechanical engineering, architecture, both in wood and stone, plumbing, plastering, painting, etc., and to have a partial knowledge of rolling stock construction, engines and pumps, electrical work, and operating of roads; and also of railway financiering, sufficient to determine probable returns from proposed constructions. Financiers looking for a chief engineer of high ability to construct an important railway would turn a cold shoulder to the man distinctly professing but slight acquaintance with many of the above branches. Hence a chief is appointed, supposably, to decide and arrange for expenditures in all the above lines of work without being allowed the expert assistance of specialists in each line of work.

In consequence, the general railroad engineer, being so very general, is elbowed out of each sphere by the specialists therein, and on maintenance is corraled in an office, and produced, like his old plans and maps, only semi-occasionally and as an aid to some subordinate in shops or maintenance of way. These results, constantly seen, indicate that the railroad engineer is attempting to cover too wide a field with detail practice, and in his professions to financiers. In bridge engineering the railroad engineer is gradually and properly being retired from view by those who, from access to shops and markets, can in that line of work keep abreast of the times, just as has long been the case in regard to rolling stock. In architectural work the general railroad engineer is also drawing in his horns, leaving this to architects as railroad structures increase in importance. So also with terminal facilities, to some extent. The sooner the railroad engineer withdraws also from the professions of practical experience in mechanical work, in "higher surveying," hydraulic and sewage, and especially from positive expressions of opinion as to future returns from roads, the better it will be for his own proficiency, and for the cash accounts of his employers.

In the last named item, let him content himself with collating facts and figures, and stating cost; and leave conclusions to practical railroad managers and to shrewd men of business. By combining a fair knowledge of land surveys, the highest possible knowledge of and practice in location, and a good practical knowledge of graduation, masonry and track, he can make himself more effective and find a field out of which none can crowd him.

A general knowledge of relative desirability and cost of superstructures, architecture and rolling stock and occasional service from experts in these lines will give as good results as could be desired.

It is questionable whether any field of work exists where such enormous savings and improvements would reward the specialist as in location. Even local division engineers find changes possible that are worth from $50,000 to $250,000 in some instances. At a low estimate, probably from 20 to 30 per cent. of the outlay for existing roads in the United States could have been saved by specialist work in location. This in spite of the fact that our extended territory gives the United States good locating engineers, as compared with European countries. Where a dollar of economy is possible in construction, a hundred dollars of saving is possible in location. The engineers who have expertly *avoided* expensive and imposing constructions to which they can point with pride, are not always the best known to capitalists.

Nowhere, however, is the expenditure of enormous sums of money more unreservedly left to the decision and ability of one man. The best work of a locating engineer is often either zero or minus in its nature. Whatever be its nature, however, the increasing army of specialists in other branches is crowding the general railway engineer each year into a narrower but better field, namely, of location and field construction exclusively.

QUISQUIS.

Elevation and Gauge of Curves.

TO THE EDITOR OF THE RAILROAD GAZETTE:

As the question of elevation of the outer rail on curves seems to be still open for discussion, an account of an accident which was caused partly by too much elevation of the outer rail may be of interest.

In the early part of 1885 I made a trip over the Guatemala Central Railroad, from Guatamala City to the port of San José, on the Pacific coast. This road is of narrow gauge (3 ft.), and on part of the line, between Palin and Escuintla, has some 15 deg. curves on a grade of 5 per cent. without any compensation of the grade for curvature. This section of the road is a good (or bad) example of what can be done by incompetent men in the way of making a bad location. I would undertake to locate and construct this section, on a maximum grade of 4 per cent., duly compensated on curves, and without exceeding the present degree of curvature, for the same amount of money (or perhaps less) that it has cost to construct the present road. Of this I speak knowingly, as I was appointed by the Government of Guatemala to inspect and report on this section of the road, and carefully studied the ground at that time. And yet this section was located under the immediate direction of a West Point graduate, who, whatever capabilities he may have had in other branches, certainly did not show here any "natural gift" for location. I may say here that I firmly believe that to make a really good locating engineer a man must be "born" to it, as I have seen so many cases where engineers who had worked for years on location surveys were utterly incapable of grasping the possibilities of the country through which their lines passed, while others making a reconnaissance on horseback or on foot over the country will pick out almost at a glance a line for their road which wi l only be changed in detail by the final surveys; and even although other lines may be surveyed, the line originally selected by the eye of the experienced "natural locator" is almost invariably found to be the best. Of course, the "natural locator" is expected to use a barometer and pocket compass to guide him as to the possibilities of grades and alignment.

But, to return to the accident, the train on which I was traveling was composed, as near as can be remembered, of a *forty-two ton* Consolidation locomotive and tender, built by the Danforth Locomotive Works, one empty flat car, one empty box car, one box car loaded with about ten tons of coffee in sacks, two other box cars loaded with miscellaneous freight, one baggage and mail car, one second-class and one first-class coach, all being placed in the order named. The train was running at the rate of about five miles an hour, down the 5 per cent. grade and around a 15 degree curve, being under perfect control of the engineer, by means of air brakes on all the cars, steam brakes on the drivers, and hot-water brake in the cylinders, when it suddenly stopped, with only a slight jar in the last coach. On looking out I found that the locomotive and all of the freight cars were lying *bottom up* on the *inside* of the curve, and at the foot of an embankment five or six feet in height. The driver went down with the engine, but luckily escaped with a few slight bruises. The baggage car and coaches remained on the track.

On asking the engine driver how the accident had occurred, he informed me that the car loaded with coffee had first upset and then carried with it the other freight cars, and, finally, the locomotive, and that on seeing the car turn over, he had immediately applied the steam and air brakes, but did not think of leaving the locomotive himself, as he had no idea that anything would happen to it at that low rate of speed. As it seemed very strange that the strength of the coupling between the locomotive and the cars behind it should have been sufficient to overturn such a heavy weight, the writer, in company with the conductor, made a thorough investigation of the circumstances. We found that the super-elevation of the outer rail was from 5 to 6 in., and in one place 7 in., and that the track was *exactly* of 3 ft. gauge, no extra width having been given on the curve. On going back about 150 ft. found that one truck of the box car containing the coffee had "climbed" over the outer rail and "bumped" along over the ties up to the point where the car left the track entirely. The conductor informed me that the coffee had been very badly loaded in this car by the native station hands, the sacks being piled up high on each side of the car, with an alleyway in the centre, but that he had no time to change it. The locomotive and all the cars, except the last truck of the last freight car, cleared the track completely, and the only marks on the ties or road-bed were those made by the truck of the coffee car above referred to. The course and causes of this accident were undoubtedly as follows: First, the truck of the coffee car left the track, owing to the impingement of the flanges on the outer rail, due to the extreme tightness of the gauge; then the badly-loaded coffee sacks on the upper side of this car were tumbled down to the lower side by the "bumping" on the ties, and the car turned over, carrying after it the other freight cars and the locomotive, which were dangerously near the point of unstable equilibrium, owing to the great elevation of the outer rail. I could not get a drawing of the locomotive, but as near as I could calculate a perpendicular from the centre of gravity of the body of the locomotive would strike not over 6 or 8 in. from the inside rail, and therefore it did not take much force to overturn it.

I found afterwards that the rule for elevation on this road was ⅛ in. to the degree, which the trackmen often increased to suit their own ideas, although the speed on any part of the line never exceeded 20 miles per hour, and on the section where this accident occurred strict orders had been given not to exceed 8 miles per hour with any train.

On no part of this road were the curves widened in gauge, a practice I deem essential on sharp curves on narrow-gauge roads, and which I believe to be beneficial at all times. On some of the sharp curves of this road, with *exact* gauge of 3 ft., I have found the inside of the inside rail worn just as bright as the outside rail from contact with the wheel flanges, and in the dry season I have seen the iron filings lying by the side of the inside rail where they had fallen from rail and flanges. I have found a good practice for widening, on 3 ft. gauge roads, to be as follows:

Up to 5° curve widen ¼ in.
5° to 10° curve widen ½ in.
10° to 15° curve widen ¾ in.
15° to 20° curve widen 1 in.

and, I believe, that this materially decreases the curve resistance, although I am aware that some of the standard gauge authorities do not hold the same opinion.

For elevation of the outer rail, I think that the table given by Shunk, p. 142, of his *Field Engineer*, is very good for narrow-gauge practice, although I would never make the super-elevation greater than 5 in. for 3 ft. gauge. S. M.

NEW YORK, December, 1886.

[An accident exactly similar to that described, except that there was no bad loading, happened on the Mexican National Railway, on the mountain grade near Mexico, shortly after its construction. The train had been stopped in the middle of a very sharp curve (about 24 degrees) because of a derailed wheel or some other cause which we do not now recall, and the moment the train came to a dead stop it quietly "flopped over." The elevation had become excessive by settlement of the side-hill bank, and although entirely safe for ordinary passage was not equal to the extra demand for stability. The narrow wheel-base and wide car-body of narrow-gauge cars make this peculiarly liable to occur with them.

Wherever the inside rail of a curve is flange-cut on the side by ordinary American truck wheel-bases, there is evidence that the gauge is too tight. With long European wheel-bases it would be impossible to widen the gauge on a sharp curve so as to avoid inside rail flange cutting. But as to whether it is advantageous or wise as a general rule to widen gauge on ordinary curves for ordinary American rolling-stock there is a good deal to be said which our correspondent does not say, and we imagine that it is not. On curves as sharp as 15 degrees it is another matter. EDITOR RAILROAD GAZETTE.]

Factors of Safety.

ANN ARBOR, Mich., Dec. 24, 1886.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Bearing upon your reference to the above subject in your able article on "True Economy in Bridge Building," in your issue of the 10th inst., it is interesting to note that in the firs

edition (1862) of Rankine's "Civil Engineering," the author states that there are three kinds of factors of safety, viz.: "the ratio in which the *breaking load* exceeds the *proof load* (*i. e.*, the elastic limit); the ratio in which the *breaking load* exceeds the *working load*, and the ratio in which the *proof load* exceeds the *working load*."

"When not otherwise specified, a factor of safety is, in general, to be understood in the second of those senses, viz., the ratio in which the breaking load exceeds the working load."

"The following table gives examples of the values of those factors which occur in actual structures:

	Ult. strength ÷ Proof strength.	Ult. strength ÷ Working load.	Proof strength ÷ Working load.
Strongest steel	1½	....	....
Ordinary steel and wrought iron, steady load	2	3	1½
Ordinary steel and wrought iron, moving load	2	4 to 6	2 to 3
Wrought iron riveted structures	3	6	2
Cast iron, steady load	2 to 3	3 to 4	about 1½
Cast iron, moving load	3	6 to 8	2 to 2⅔
Timber, average	3	10	3⅓
Stone and brick	about 2	4 to 10, av. ab't 8	av. about 4

In the modern editions of this work any mention of the first and third kind of factor of safety is strangely omitted.

This alteration was no doubt considered to be "rendered necessary by the progress of civil engineering," but the progress of civil engineering would have been more satisfactory if it had rendered necessary the omission of the first and second kind of factor instead of the first and third.

To my mind a great deal of the mischief has been due to our use of the terms "ultimate strength" and "limit of elasticity"; the one being misleading, the other not sufficiently simple. If for the former we had used some such term as "temporary strength" and for the latter "permanent strength," great loss of life and money would have been avoided.

ALFRED D. OTTEWELL.

Master Car-Builders' Association Circular.

The Secretary, Mr. M. N. Forney, makes the following announcement:

In response to the circular dated Oct. 20, 1886, which was sent to the members of the Association, there were 243 votes cast in favor of the adoption, as a standard, of the plans for trucks of freight cars of 40,000 pounds capacity, submitted with the circular, and 163 votes against their adoption. As two-thirds of all the votes cast are required for the adoption of standards, the proposed plans for trucks have *not* been adopted.

Composition of High Explosives.

Some recent law suits have brought out some interesting information on this subject, which have been summarized by Prof. Chas. E. Monroe, U. S. N. Some extracts from this information are as follows:

The compositions of the various explosives that the Atlantic Giant Powder Company regarded as infringements of their patents, were as follows:

Vulcan Powder.

	Per cent.
Nitro-glycerine	32.60
Nitrate of soda	49.46
Charcoal	9.63
Sulphur	8.31

Neptune Powder.

	Per cent.
Nitro-glycerine	32.66
Nitrate of soda	45.04
Charcoal	17.44
Sulphur	4.86
Ash	0·94

Miners' Powder Company Dynamite.

	Per cent.
Nitro-glycerine	32.91
Nitrate of soda	49.88
Charcoal, wood, and partially charred wood	17 21
Ash	1.18

Brady's Dynamite or Vulcan Powder.

	Per cent.
Nitro-glycerine	33.00
Nitrate of soda	50.00
Charcoal	10.00
Sulphur	7.00

It will be observed that all these powders are practical dynamites in which gunpowder is used in place of infusorial earth as the absorbent. In regard to the powder made by Michael Brady, Thomas Varney, a manufacturer of nitro-glycerine, dynamite, etc., testifies that it "belongs to a class which is now quite large and known as high-explosive powder. Some of their names are giant powder, mica powder, Vulcan powder, Jupiter powder, Neptune powder, thunderbolt powder, Hercules powder, Titan powder, rend-rock powder, vigorite powder, lithofracteur dualin.

"They are made by mixing nitro-glycerine with a dry pulverized substance or mixture of substances such as have the capacity of taking up and holding a sufficient proportion of nitro-glycerine by absorption to make the mixture an effective explosive, and yet without being in such excess as to separate from the mass by leakage or compression, and at the same time the absorbent solids employed being such as will not chemically injure the proper explosive quality of the nitro-glycerine, and such as will render the mass practically inexplodible by concussions which ordinarily occur in handling and transportation. The solid ingredients, to wit, the nitrate of soda, charcoal and sulphur, are first ground or otherwise pulverized, and dried if necessary. The nitro-glycerine is then carefully mixed with them, so as to make a mass as nearly homogeneous as practicable, and the powder is then packed for market.

"In the manufacture of Vulcan powder, there is a combination of nitro-glycerine with absorbent substances which are the equivalents of infusorial earth; and this combination constitutes an explosive compound which has all the properties and qualities of the compound made by combining nitro-glycerine with infusorial earth in making dynamite or giant powder, or with mica scales in making mica powder, or with mealed gunpowder in making Vulcan powder.

"In the first place, each of the materials used as absorbents in the Vulcan powder is solid. In the next place, they are all free from any quality which will decompose, destroy, or injure the nitro-glycerine. They are capable of pulverization. They are also dry, or may be made so. When pulverized, each of them alone, or all of them in proportions actually used, or in any other proportions, will absorb and hold nitro-glycerine to the extent required by the patent sued upon, to wit, enough to make an explosive powder without rendering the powder leaky, and without any explosive aid from the absorbents themselves.

"Dry pulverized nitrate of soda will thus hold 30 per cent. of nitro-glycerine, charcoal 45 per cent., sulphur 30 per cent. (all these are explosive compounds), and when combined, as in Vulcan powder, they will thus hold 33 per cent.

"A mixture of 70 parts of either infusorial earth, charcoal, or sawdust with 30 parts of nitro-glycerine is inexplosive, yet either of the following mixtures is explosive:

	Parts.
Nitrate of soda	75 or 40
Charcoal	10
Nitro-glycerine	15 " 15
Sawdust	20

Also these are explosive:

Gunpowder dust	90
Neptune compound	90
Nitro-glycerine	10 " 10

"The nitro-glycerine does not receive explosive aid from the Neptune compound, from gunpowder, from gunpowder dust, and from a mixture of sawdust and nitrate of soda. It is a well-known fact that gunpowder is more effective when exploded by percussion caps than by simple fuse. Some consumers (contractors) always use percussion caps for that purpose. For the same reason, caps are better to explode Neptune powder, but Neptune powder is largely used by some parties and exploded (without cap) by fuse alone. In such use, the powder of the Neptune powder explodes the nitro-glycerine of the Neptune powder in the same manner as indicated in the patent to Nobel, No. 50,617, filed 10th May, 1865."

Dr. Henry Morton, President of the Stevens Institute, testified "that, while at North Adams, in December, 1875, I mixed 52 parts of nitro-glycerine with 48 parts of infusorial earth sent me by the complainants, and made this into a cartridge of the usual form, and inserted in this an 'exploder' or cap containing 16 grains of fulminating mercury. When this was fired in the usual way the cartridge did not explode. I then placed another 'exploder' or cap containing 22 grains of the fulminate in the cartridge, and inclosed the whole in a short wrought-iron tube, tamping the ends with sand. On firing this 'exploder,' the iron tube was split open by the force of its explosion, but the mixture of infusorial earth and nitro-glycerine remained unaffected as before. I am, therefore, quite certain that a mixture of infusorial earth and nitro-glycerine in the proportions found by Dr. Hayes between the gunpowder and nitro-glycerine in the explosive compound [Neptune powder] of defendants, would be totally inexplodible."

The injunctions against the manufacturers of Neptune and Vulcan powders were granted. The value of this monopoly may be shown as follows: It is claimed that with proper exploders a dynamite composed of 30 per cent. nitro-glycerine and 70 per cent. meal powder will do as much work as a dynamite composed of 75 per cent. of nitro-glycerine and 25 per cent. of infusorial silica. The difference in cost may be estimated as follows:

Vulcan Powder.

70 pounds of meal powder at .04	$2.80
30 " " nitro-glycerine at .40	12.00
100 pounds of powder cost	$14.80

Dynamite No. 1.

25 pounds of infusorial silica at .03	.75
75 " " nitro-glycerine at .40	30.00
100 pounds of dynamite cost	$30.75

In a previous suit Judge Blatchford issued an injunction against the manufacture of the following powders:

	No. 1.	No. 2.
Nitro-glycerine	67.64	27.86
Cellulose (paper stock)	16.82 (sawdust and charcoal)	5.59
Nitrate of soda	15.54	66.55

TECHNICAL.

Durability of Timber under Strain.

If we carefully estimate the force required to tear a piece of wood asunder, we find that lengthwise of the grain requires the greatest force. If we subject it to the pressure across the grain, for every degree we bend it we find this resistance increased 11,617 per cent. (an average of 13 varieties of wood tested), increasing in direct ratio until sufficiently bent to displace its molecules, when, of course, its strength decreases rapidly. Timbers, then, subjected to a certain tension in the building will outwear those not subjected to it. Again, a timber bearing a certain number of tons of weight for a certain length of time, will bear a much heavier weight without being unsafe, than if the timber having lain idle should afterward be loaded. This increase of strength may be proved by the following experiment:

Three pieces of some brittle wood, carefully made of equal size, are placed side by side, with one end resting on some firm base, on one is placed 100 grams, and on another 500 grams, and they are then left for a week or more in a warm, dry situation. The one bearing the greatest weight will have bent the most, and will bear more weight than the more lightly loaded piece, while the same weight placed on number three will break it. This proves conclusively that a certain weight placed on a timber renders it capable of bearing one still greater subsequently. A timber with all it will bear without displacement will actually bear more additional weight subsequently, and keep on increasing in both its wrenching and tensile strength than if it is laden one-half as heavily at the outset.

Viewed with a microscope, we find that the instant the wood is bent out of the true the fibers become closer at the bend or angle. Now if the pressure is continued just far enough to bring these in actual contact without force sufficient to mar or bruise them, they adapt themselves to the situation, and are absolutely *glued together* by the gummy substances liberated by the cells ruptured in the bending.

Furthermore, timbers subjected to pressure will decay less rapidly than when not. A stick of lancewood bent double, and the ends made secure, and the same exposed to the influences of decomposition will show the effects much sooner in those portions not bent than where the sharp angle appears; moreover, a stick actually broken in bending will not rot so soon at the break as at some distance from it, and fungous growths rarely appear at the point of bending as soon as elsewhere.

At first sight it would appear that, subjected to constant pressure, wood would undergo the same change as iron, but experiment has demonstrated the contrary. In some of the ancient ruins of Europe those portions which apparently sustain the greatest pressure, such as roof-trusses, gables, etc., are in a much better state of preservation than the joists which were merely supports for nailing, etc.—*American Architect.*

New Swiss Regulations for Tests of Cement.

Various building and architectural associations in Switzerland have united in drawing up a set of rules which are considered up to the latest advances of science in this direction; The passage referring to the time of setting is considered of special interest. The following are the principal features of the regulations:

1. *Definition.*—Cements are divided into 1. *Hydraulic Lime* (*a*) as light hydraulic lime; (*b*) as heavy hydraulic lime. 2. *Roman Cement* (*a*) as quick-setting cement; (*b*) as half-slow setting cement. 3. *Portland Cement* (*a*) as natural Portland cement; (*b*) as artificial Portland cement. 4. *Hydraulic Fluxes.*

2. *Packing and Weight.*—All to be in the form of powder, packed in sacks or casks, and to be sold at a price per 100 kilos. (220.46 lbs.). The gross weight of a sack is to be 50 kilos., and that of a cask 200 kilos. Sacks to be sealed with lead. All different forms of packing to be given up after Jan. 1, 1884.

3. *Time of Setting.*—According to their uses, cements may be required to be quick or slow setting. Quick-setting cements are those in which hardening commences within ten minutes. If it commences after 30 minutes the cement is slow-setting; if between the two half slow-setting. For defining the time of setting some pure cement is stirred into a stiff paste, and a metal box (1.57 in. high and 3.14 in. diameter), placed on a glass slab, is filled with it. The moment when a normal needle of 0.0015 sq. in. section, (.0437 in. diameter, a little over no. 19, B. W. sq.), loaded with 0.66 lbs., can no longer entirely penetrate the hardening substance, marks the beginning of hardening. Within the time from the filling of the box to the beginning of hardening every cement is to be worked. The interval until the cake is so far stiffened that the normal needle no longer leaves any perceptible impression is called the time of setting.

4. *Constancy of Volume* must be retained in hardening, in the air as well as under water.

5. *Fineness of Grinding.*—Substances must not leave behind more than 20 per cent. of coarse portions on a sieve with 900 meshes per square centimetre (0.155 square inch), the thickness of the wire being .0039 inch.

6. *Testing.*—Strength to be tested by means of mixtures with sand. One part by weight to three of sand is to be considered a normal proportion for mixing. Normal sand is pure washed quartz sand, sifted in a sieve of 64 meshes per 0.155 square inch, for the removal of the coarsest portions, the finer portions being then removed by means of a sieve with 144 meshes per 0.155 square inch. The residue on the sieve is normal sand. In the preparation of the mortar the addition of water is in proportion to the weight of the dry substance. If a manufacturer does not recommend any other proportion for his product the addition of water is understood to be as follows, in per cent. of weight of dry mixture:

	Extension test.	Pressure test.
For normal Portland cement mortar	10	8
For normal Roman cement mortar	..	..
For quick-setting material	13	12
For slow-setting material	11	9
For hydraulic lime mortar	12	10

As the duration of the working of the damped mortar has an influence upon the results of the trials for strength, the duration of working for quick-setting cements is fixed at one minute, and for slow and half-slow kinds at five minutes. All the specimens must be kept for the first 24 hours in the air, but in a position sheltered from draught and from the direct influence of the sun's rays. For the remainder of the time until immediately before the test they are to be kept under water.

7. *Test of Extension.*—For ordinary samples of quality the 28 days' test for normal water-hardening is decisive. In this the following minimum strengths of extension are fixed:

	Per sq. in.
Hydraulic lime	113.78 lb.
Roman cement	142.23 lb.
Portland cement	213.34 lb.

The Test of Pressure and the Classification of Hydraulic Binding Substances.—The test of pressure after 28 days' normal water-hardening is a definite and reliable standard, and the following classification of hydraulic binding substances is based on it:

	Minimum resistance to pressure per square inch.
Portland cement	133.40 lb.
Roman cement	1,137.80 lb.
Hydraulic lime	711.15 lb.

The above are the leading features of the code of regulations in question. Various details are also given bearing on the exact manner recommended for carrying out the various tests to which reference has been made.

A Ship Railroad on the Columbia River.

The Portland *Oregonian* of Dec. 3 says: "In his remarks before the Board of Trade last Saturday, Senator Dolph spoke at some length in favor of the project for a steamboat railroad at the Dalles of the Columbia. He said truly that the proposed improvement at the Dalles was the counterpart of the improvement at the Cascades; that they should have 'been commenced at the same time, carried on together and completed, if possible, at the same time.' While this view of the case is by no means new it is only just now coming to be recognized generally. The canal at the Cascades will be of small value if the obstructions at the Dalles remain. Until both works are accomplished the main body of the Columbia River basin will get no relief.

"In the far-away future, no doubt, there will be a canal at the Dalles. But it will take many years and cost many millions of dollars to make it. In the mean time the country needs the means of transporting its productions to the ocean. It has been proposed, as the readers of the *Oregonian* well know, to make a portage railroad which will pick up steamboats bodily and carry them inland around the obstructions. The plan is precisely like that of Capt. Eads for an Isthmus ship railroad, with the exception that it is on a small scale and proposes the expenditure of hundreds where the Eads scheme calls for thousands. Engineers consider it entirely practicable, and practical transportation men declare that it would save to the producers of the Columbia river basin in the matter of freights $1,000,000 the first year, and eventually 10 times that sum per annum.

"The cost of the proposed work, it is estimated, will be between $1,300,000 and $1,400,000, and this amount will have to come in one or two general appropriations. To postpone the work from year to year would be to double or treble its cost. Senator Gorman, Chairman of the Senate Committee on Appropriations, who was in Oregon last summer, declared that he would work for the project in every possible way, and that he was in favor of appropriating the money in a lump. His interest in the plan is largely experimental. The assistance of Senator Gorman will be very valuable, and we are likely to have still more powerful help from the supporters of the Eads bill, who would like to see this work accomplished as a means of showing what can be done at the Isthmus. If an earnest push is made before Congress for the money there is a chance to secure it. The situation is favorable, and the utmost effort should be made during the coming session of Congress."

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Passes.—*All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.*

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The two horrible disasters of Jan. 4 are reported as we go to press. The cause of the greater one is not yet given in any definite manner. The first impulse is to reprint, in letters of blood, the solemn warnings that have appeared so many times before, and so recently too, in not only the *Gazette* but from hundreds of influential sources throughout the land. Warnings without number have been given, and have been more or less reflected upon, but the action which ought to result therefrom seems, in the light of these terrible realities, to be insufferably slow. Whatever may be said on the other contributing causes, the heater problem, at least, seems open for a decided advance. Experiments of a highly satisfactory nature have been made in various quarters, notably on the New York Elevated lines and on the Connecticut River road, as noted in the *Railroad Gazette* of Dec. 17; and no manager with a conscience ought to feel easy, after reading the appalling details of this week's horrors, without making active efforts to promptly profit by these valuable experiments of other people, or to enter upon an investigation himself.

The Central Railroad of Georgia passes this week under the control of an entirely new management, the opposition party having elected its ticket by a vote of 43,000 out of a total of 75,000 shares, displacing Mr. Raoul, the son-in-law and successor of the late Mr. Wadley, who was for so many years President of the company, and whose policy and methods have continued until now to control its management. The new President, Gen. E. P. Alexander, has been connected with the Louisville & Nashville, and was for a time President of the Georgia Railroad Company. It was claimed for him before the election that he would be an active and progressive officer, who would discard the more conservative methods of Mr. Raoul. It was also claimed that his policy would be to develop and build up the local business of the road, and, incidentally, the country which it serves.

Gen. Alexander's election has been, however, due apparently not to the local stockholders, but chiefly to New York parties who have been for some time buying up the stock of the company, and have secured a considerable amount from small local holders, and have also bought up the large blocks which were previously held in New York and Savannah. What the purpose of these new owners is has not been made clear as yet; the current report is that they are the same parties who recently obtained control of the West Point Terminal Company and, through it, of the Richmond & Danville road. This is not certainly known, however, although very probable.

The Central Railroad lines could be operated in the Richmond & Danville interest with considerable profit to that company, although a very considerable part of its traffic has come and will continue to come from the West, and its natural alliance would be with one or more of the lines to the Ohio River. A close connection with the Richmond & Danville must be of more advantage to that company than to the Central stockholders, a large part of whose dividends of late years have been derived from the profits of the company's steamship line between Savannah and New York. The interest of the Richmond and Danville would, of course, be to take all the business possible northward by rail instead of water, and to what extent this would be done would, most probably, be determined by the comparative extent of the managers' ownership in the two companies.

December earnings are reported by 21 roads so far, the total result being as follows:

1886.	1885.	Increase.	Per cent.
$13,976,956	$12,366,547	$1,610,409	13.0

Twenty of these roads show gains, many of them being large; one only shows a decrease, that one being the Chicago, Milwaukee & St. Paul, whose earnings were 3.7 per cent. less than in December, 1885. No other Northwestern line has yet reported, except the Milwaukee, Lake Shore & Western, which continues its exceptional gain; other increases in that quarter were hardly to be expected.

Two eastern roads report, the New York Central showing a gain of 25.6 and the Long Island of 2.6 per cent.

We have also the earnings of two Southern lines, the Louisville & Nashville gaining 9.6 and the Norfolk & Western 8.4 per cent.

Eight of the central group of roads are included in the table, and nearly all of them show heavy gains, the Chicago & Atlantic leading with 40.8 per cent., while the Toledo & Ohio Central had 37.6, the Cairo, Vincennes & Chicago 23.4 and the Peoria, Decatur & Evansville 22.6 per cent.

The two Southwestern roads reporting made a good showing, the St. Louis, Arkansas & Texas having an increase of 36 per cent., and the St. Louis & San Francisco 9.5 per cent.

The remaining roads are the Northern Pacific, which makes an exceptionally good showing for December, having a gain of 13.4 per cent., and larger earnings than it has ever before showed in a winter month; the Canadian Pacific, which gains over 20 per cent., but on a greater increase in mileage, and the Denver & Rio Grande whose increase of 22 per cent. is exceptional, although it has shown moderate gains throughout the year.

November earnings are reported by 12 roads, 11 of which report net earnings also. Most of these are of minor importance, the only lines with heavy earnings being the Union Pacific and the Atchison, Topeka & Santa Fe. The Atchison has for the month a gain of 7 per cent, gross, but a net decrease of 1 per cent. in net earnings. The later months of the year on this road have offset the decrease of the first half and the earnings for the year are substantially the same as those for 1885.

The New York & New England in November shows a gain of 13 per cent. in gross and 12 in net earnings, which, though less than in some previous months is still sufficiently satisfactory.

The Union Pacific reports for the month a decrease of 1 per cent. in gross earnings, but the expenses so increased that there was a falling off of 16 per cent. in net receipts. The month, however, has closely followed the course of earnings on this road for some time past.

THE DISCUSSION AT THE TIME CONVENTION.

Not the least of the good results of the bringing before the General Time Convention of the project of uniformity in train rules and its successful advancement to the present hopeful stage has been the valuable and instructive discussion among the general managers and superintendents on the important and interesting details included in the primary subject, which came up for consideration when the newly arranged code was presented for acceptance. As we have perhaps before intimated, it is a decided good and will be recognized as a really valuable contribution to the general knowledge on these topics, simply to have had the discussion, bringing out such a wide range of thought and views and giving so much stimulation to the slow-going, or thoughtless, or preoccupied. The final results may, for the moment, be left out of consideration.

It is a fact that superintendents are not inclined to talk. Whether garrulousness is always incompatible with executive ability, or what the reason is, we cannot say; but it seems to be widely accepted as a foregone conclusion that the better operating manager a man is the less likely he is to tell what he knows. We cannot believe that this silence is all superciliousness; that, as one superintendent said to the writer, the whole fraternity are so tremendously conceited that they can see no possible advantage in getting others ideas and so have no motive to lead them to tell their own; the causes are rather to be found in the engrossing nature of the duties many of these men are burdened with, and in their traits of modesty and diffidence, which honest and thoughtful men in semi-public places have in as good measure as other people do, notwithstanding the aforesaid other people think differently.

However this may be, the convention certainly had a goodly number of exceedingly valuable speakers, and if this occasion is the first on which they have ventured to give their brethren the benefit of their experience and reflections, we can only regret that it did not come earlier, and trust that this is only a beginning of an indefinite series of future discussions.

While the members of the committee did a large share of the talking, and did it, it should be noted in passing, in the utmost candor and fairness, showing not the least bias, or disposition to defend their own work too zealously, there were many valuable contributions from other sources. The convention showed itself superior to Congress and ordinary legislative bodies in that it had a "champion objector," as persistent inquirers are somewhat contemptuously termed, and not only refrained from snubbing him, but actually derived substantial benefits through his instrumentality.

Not all the idle or silly questions were asked by men from obscure roads by any means. The report of the discussion leads to the possible inference that some quite prominent roads, instead of sending their ripest scholars (if literary readers will pardon the use of the term in referring to railroaders), sent the officer who most needed enlightenment. Some rules wrong in principle were left untouched or approved in an apparently careless manner, as for instance the allowing of trains to hurry into meeting points ahead of time, which is sure to tempt freight men to run too fast; and the calling attention to signals carried (which, by the way, is as necessary on double track as on single), though this latter was decided the wrong way by a vote of only 18 to 14, a very light one. In the main, however, highly valuable results came out of nearly every discussion. The clear and terse manner in which the spokesman of the committee explained the utility of the green and white signal for stopping trains to take on passengers is an example; though in practice it seems to us the weak features of this signal will not need bolstering or defense, for the reason that it is not generally necessary that it be seen at a great distance. Signals used at short range can be modified in many ways that are wholly out of the question in long distance problems. The same gentleman's admirable defense of the distinctive (blue) signal for protecting car repairers was also a good stroke. We hope, however, that managers and manufacturers will evolve a really good blue light. Many now in use can hardly be called blue with truthfulness, and are a disgrace to their originators.

But one of the most disagreable features noticed, both in the questions that were satisfactorily settled and in those that baffled the meeting, was the frequency with which very simple yet important reforms were made to appear wholly impracticable because of a slight lack in appliances, or some imaginary obstacle in practice. The unsatisfactory way in which the classification of switching trains was left' would seem to be very readily remediable by the adoption of some device to render the number of the engine or the word "switcher" or its equivalent easily discernible in the night; the unbusinesslike plan advocated for showing the arriving, meeting and leaving times at meeting points could be entirely obviated if the convention would only give some bright and enterprising printer an opportunity to show how good a time table can be "set up" in an ordinary printing office when the attempt is persistently made; and so with other details. The rules, if adapted rigidly to existing conditions, will always suffer from hampering limitations, and some of the best will have to be omitted entirely, because "the committee finds such a diversity of practice." The convention, if progressive, will sooner or later have to face the question of making the practice conform to the rules, instead of following the opposite method so closely; and it will be well to bear this point in mind.

On the whole, there is, as we have intimated above, an indefinite field for future discussion and improvement, and good ground for expecting valuable results from such action. Doubtless the great majority of the participants in the late convention view it in this light, and look forward with much hopefulness to future meetings.

THE ABT RACK RAILROAD.

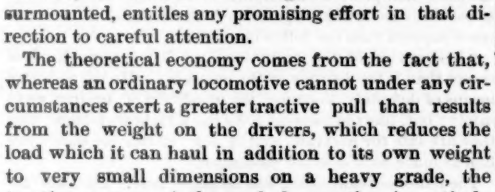
We devote a considerable space this week to the first part of a paper by the late Walton W. Evans, describing in much detail the Abt system of rack railroads, which has attracted so much attention abroad, and which certainly bears every mark of being a decided advance on the plans of the kind heretofore in use. The great attention which plans of the kind attracted in the early days of railroads has been gradually falling off, since the cumbrous devices of those days did not stand the test of service, but the immense theoretical economy which may be realized by the use of something of the kind, if efficient and durable, at localities where high elevations are to be surmounted, entitles any promising effort in that direction to careful attention.

The theoretical economy comes from the fact that, whereas an ordinary locomotive cannot under any circumstances exert a greater tractive pull than results from the weight on the drivers, which reduces the load which it can haul in addition to its own weight to very small dimensions on a heavy grade, the tractive power of the rack locomotive is entirely independent of its weight. It can cause the same power to exert any tractive force whatever at the mere cost of a corresponding reduction in speed. For example, a consolidation locomotive will haul some 390 or possibly 400 tons besides its own weight (or about 5½ times the latter) up a grade of 100 ft. per mile at 8 or 10 miles per hour, but if the speed be cut down to four miles per hour it cannot haul any more, or but very little more, because its adhesion is the measure of the pull it can exert, and this is no greater at the one speed than at the other.

The very same steam power, exerted through a rack engine of the same weight, will either haul the same load at 10 miles per hour, or *twice* the load at five miles per hour or *four times* the load at 2½ miles per hour, all on the same grade. Or, instead of varying the load, the grade may be made about twice or four times as steep with the same result. And as the length of line by which the ascent is made to any given elevation can in practice be reduced in very nearly the same ratio as the grade is increased, this means again that the ascent to any given elevation can be made by an efficient rack locomotive in the same time but in one-third or one-fourth the distance.

We are far from saying or implying that the Abt device is such a locomotive, or even that it will ever prove practically possible to utilize these theoretical possibilities, but that the Abt device is a long step in advance in that direction may already be asserted, and quite apart from the admitted and recognized field from such devices in highly mountainous and rugged regions where railroads of the ordinary type are all but impracticably costly, the enormous economies which might conceivably be effected in more favored localities should at least be always borne in mind.

Let us take, for instance, the case of the four great trunk lines—as an example which every one can follow. The characteristic of every one of these lines is that they have long stretches of exceedingly favorable grades interspersed by points where high elevations must be climbed over on very much heavier grades. The New York Central has only one such point, and that a small one, at Albany, and we may throw it out of consideration. All the other three lines have one or more pieces of mountain grades on them, to which the sketch in light lines below (marked *a*) bears a general resemblance:



Between *A* and *B* may be 30 miles. Trains of 40 to 60 cars hauled by one engine arrive at *A* or *B*, while between *A* and *B*, perhaps, it takes the work of three engines to do the work of one on either side. On each one of the three trunk lines a very large proportion of the total cost of hauling, which it is quite unnecessary that we should stop to estimate exactly, is expended at just such points, which aggregate, all told, but a small part of the total distance. All these roads, moreover, are hard pressed, first, to accommodate at times their growing traffic, and secondly, to make both ends meet with enough over for dividends out of the rates which have shown such an inveterate tendency to fall in the last 15 years, and which there is every reason to believe will continue to fall until the last mechanical possibility in the direction of cheap haulage has been exhausted.

Now, let us assume for the moment, and for the sake of argument, that the Abt rack locomotive or some other, as it is or as it may become, is capable of accomplishing in regular service and without undue cost for repairs what is claimed for it, and is unquestionably theoretically possible. What possibilities of economy does it offer in such a location?

Let us assume the height of the summit *S* to be 1,000 ft. The peculiarity of the Abt engine is that it works on a level or on a moderate grade like an ordinary locomotive, and when it strikes the very steep rack grade the ordinary adhesive traction cylinders continue at work as before, and do what work they can;—even on a 10 per cent. grade (528 ft. per mile) a locomotive will lift itself and haul one or two cars, if it has good luck—while separate cylinders operate the rack-driving gear and do the main work of hauling or pushing the train, working conjointly with the ordinary drivers. In the ingenious method by which the pinion engages automatically with this rack and works smoothly and noiselessly in it without intermediate gearing Mr. Abt's improvements mainly lie. Let us suppose, therefore, that instead of taking 10 miles to climb 1,000 ft. on a grade of 100 ft. per mile, a rack grade *p*, 3 miles long, were built on a grade of 333 ft. per mile, starting from both *A* and *B*, with a stretch of connecting track *c*, to the summit *S* on a slight down grade.

The same train which would be taken to the summit by an ordinary adhesive traction engine over the track *a* would be taken to the summit of the rack grade *p* by a rack engine of the same weight in the same time, from which point the cars could descend by gravity to *B* in trains of suitable length, without any locomotive whatever, as has been done for the past 50 years on the gravity roads of Pennsylvania. The saving is that, instead of the locomotive and crews having to run from *A* to *B*, or 30 miles, they would only have to run up the plane *p* and back again, or 6 miles; in other words, there would be a saving of some four-fifths of the locomotive mileage required at such a summit, less the extra cost per mile of running the rack engines. This would no doubt be considerable, as the fuel consumption per mile would certainly be very much greater, since the train is lifted 3⅓ times as high in a given distance; but it would still leave room for a very large possible economy, after making all allowances.

There is still greater room for a possible economy in some application of the modern cable system on short steep grades, like *p* in the sketch above, with a system of grades otherwise such as sketched. It is needless to say that this system differs materially from the old inclined plane devices which were abandoned so long ago for regular railroad use. The latter were an exceedingly cumbrous way of handling traffic, since they had to be absolutely straight and were in series of eight or ten, each detached from the other, so that the cars had to be moved between them by other motive power. Yet it is not generally known that the sagacious men who laid out the Pennsylvania Railroad, at the very time that they were abandoning planes, as unsuited to the then existing conditions, had in mind the creation of such a system anew when traffic should have grown large enough to keep it constantly busy—a very important factor in its economy—and laid out their lines as they now exist with an especial view to facilitate it in the future. Some exceedingly interesting and able discussions of this question are embalmed in the earlier reports of that company, which few now have access to.

The recently developed modern cable system offers possibilities in that direction which were not then thought of, and which are quite likely to attract attention earlier than is generally expected for reducing the cost of handling enormous traffic over high elevations. It accomplishes completely what a successful rack system would do partially, viz., it saves the great waste of power in lifting 70 or 80 tons of locomotive up and down a hill for every 300 to 500 tons of cars, and the great waste of human labor involved in having a hundred or more different engineers and firemen to develop an amount of power which a tenth of that number could develop by stationary power. When there was far less than a tenth of the traffic to be handled the conditions were far different. Locomotive power was then in every way preferable.

Should one of the trunk lines succeed in saving half or a third of the cost of moving traffic over such points as we have sketched above in advance of others, it would certainly place it at a great advantage, and the pressure upon them all is so great to reduce the cost and increase the facilities for handling traffic that anything which has in it even the promise of aiding indirectly to that end is worthy of attention during its process of development. For this reason, as well as because there are many localities where a good system of rack railroad would offer by far the greatest advantages for any traffic, we have given unusual space to Mr. Evans' readable presentation of what Mr. Abt has so far accomplished.

The Vanderbilt Roads.

The Lake Shore & Michigan Southern statement for the year 1886, made December 30, shows a great gain in gross and net earnings over 1885 and 1884, but a great loss compared with the four years from 1880 to 1883.

The gross earnings and working expenses (including taxes), net earnings, fixed charges and profits per share of this company for each year since its organization, are given below. As there has been no change in the amount of the capital stock, the fluctuations in the profit per share are the same as in the total balance available for dividends:

Year.	Earnings.	Expenses.	Net Earn.	Fixed charges.	Profit p. sh.
1870	$13,509,286	$8,368,821	$5,140.415	$1,828 807	$9.00
1871	14 989,444	9,779,806	5,118,643	2,121,164	8.37
1872	17,699,925	11,839,526	5,860,409	2,201,459	8.55
1873	19,414.509	13,746,598	5,6?6,911	2,654.560	6.10
1874	17,146,151	11,152,371	5,993,760	3,008,193	6.04
1875	14.434,199	10,531,501	3,902,698	2,810,294	2.20
1876	13.949.179	9,574,836	4,374,341	2,750,989	3 26
1877	13,505,159	8,953,966	4,541,193	2,775,657	3.57
1878	13,979,766	8,486.604	5,493,165	2,718,792	5.61
1879	15,271,492	8,934,524	6,336,968	2,754,988	7.24
1880	18,749,461	10,418,105	8,331,356	2,750,374	11.28
1881	17,971,391	11,278,429	6,692,962	2,725,378	8.02
1882	18.225,639	11,057.807	7,167,832	3,027,000	8.37
1883	18,513,656	11,001.854	7,511,802	3,498.806	8.11
1884	14,843,584	9,133.521	5,710,062	3,720,670	4.02
1885	14,133,506	9,287,537	4,845,869	3,867,456	1.98
1886	15,826,616	9,709,135	6,117,281	3,719,135	4.80

The gains over last year are:

In gross earnings	$1,603,110	or	12.0 per cent.
In expenses	421,598	or	4.5 " "
In net earnings	1,271,312	or	26.3 " "
In surplus for stock	1,419,633	or	145.0 " "

The profit over fixed charges, though nearly twice as great as in 1885 and a fifth more than in 1884, was less than in any other year since 1877, and 40 per cent. less than in 1883.

The favorable turn in the company's income can hardly be said to have come until the last half of 1886. In the first half of the year its surplus over fixed charges was only $571,072, while the last half it was $1,872,274, or more than three times as much. And in the last quarter of the year the surplus over fixed charges has been:

1880	$2,197,868	1884	$920,436
1881	926,260	1885	641,079
1882	1,751,156	1886	1,041,485
1883	1,200,744		

Thus there was a gain compared with 1885 amounting to $400,406, in the last quarter, against a gain of $405,000 in the second quarter, and of $435,000 in the first *half* of the year. The sinking fund absorbed $250,000 of the surplus, or 51 cents per share of stock, and above that there was $3.44 per share, while a dividend of $2 is paid, the first since 1884.

The Michigan Central likewise reports a great gain over 1885 and 1884, but in those years it barely earned its fixed charges.

It puts the matter in a more encouraging light when we say that its net earnings were, with the exception of 1883, the largest since 1880.

The aggregate gross and net earnings, expenses, fixed charges and surplus of the combined Michigan Central and Canada Southern for the last eight years have been:

Year.	Gross earnings.	Expenses.	Net earnings.	Fixed charges.	Surplus.
1878	$9,352,967	$6,437,497	$2,915,470	$1,969,377	$945,093
1879	10,342,160	7,147,683	3,194,477	1,979,235	1,215 242
1880	12,657,054	8,145,092	4,511,962	1,977,230	2,534,732
1881	12,169,746	9,404,443	2,765,303	2,371.551	393,752
1882	12,330,040	9,268,905	3,061,135	2,486,602	580,533
1883	14,009,767	9,741,639	4,268,128	2,433.416	1,834,71?
1884	11,659,077	8,959,132	2,699,945	2,648,602	61,343
1885	10,707,395	8,014,603	2,692,792	2,666,753	26,039
1886	12,250,000	8,350,000	3,900,000	2,578,000	1,322,000

The gains in 1886 over 1885 were:

In gross earnings	$1,542,605, or 14 4	per cent.
In expenses	335,397, or 4.2	per cent.
In net earnings	1,207,208, or 44 8	per cent.
In surplus for stock	1,295,961, or 4,980.0	per cent.

By the contract between the two companies the Canada Southern was to have one-third and the Michigan Central two-thirds after paying fixed charges of a certain amount, and either company was to get the benefit of any reduction in its own fixed charges. The Michigan Central has effected such a reduction to the amount of $92,000, and its share of the surplus last year is therefore $912,000, and the Canada Southern $410,000, which is at the rate of $4.87 per share to the Michigan Central and $2.73 to the Canada Southern. The dividends declared are $2 and $1.25 respectively, being the first since 1883.

What is noticeable in the reports of both compnies is the small increase of working expenses. This, doubtless, largely because of higher rates on the through traffic anp a larger amount of local traffic.

The Cleveland, Columbus, Cincinnati & Indianapolis reports for the system which it works, inciuding the Indianapolis & St. Louis and the Cincinnati & Spring field:

	1886.	1885.	Inc. or Dec.	P.c.
Gross earnings	$7,228.385	$6,411,445	+ $816,940	12.7
Gross expenses	4,766,793	4,929,274	— 162,481	13.3
Net earnings	$2,461,592	$1,482,171	+ $979,421	66.0
First charges	$2,046,652	$2,039,616	+ $7,036	0.3
Surplus	414,940		+ 972,385	....
Deficit		557,445		....
Per share	$2.77	$3.72	$6.49	....

This company paid $309,947 for improvements and additions to its equipment last year and nearly as much the year before, and no dividend has been declared since 1882, and the 2 per cent. paid then is all that the stock has received since 1880.

The publication of the quarterly reports of the New York Central & Hudson River Company enables us to give a statement of the operations of that company for the calendar year as follows:

	1886.	1886.	Increase.	P.c.
Earnings	$32,605,759	$24,495,873	$8,109 886	33.1
Working expenses.	19,876,168	16.521,495	3,354,673	20 3
Net earnings.	$12.729,591	$7,974,378	$4,755,213	59.6
First charges	7,736.085	5,900,726	1,835,359	31.1
Profit	$4.993,506	$2,073,652	$2,919,854	140.8
Dividends	3,577.132	2,682,850	894,282	33.3
Surplus	$1,416,374	*$609,198	$2,025,572	...
Profits per share	5.58	2.32	8 26	140.8
Dividends "	4.00	3.00	1.00	33 3

* Deficit.

A comparison with previous years is of little or no use, from the fact that the figures for 1886 include theearnings, expenses and rental of the West Shore road. From the way in which the quarterly statements are made there is no method of ascertaining how much of last year's increase over 1885 was due to the addition of the West Shore mileage and how much to increase of traffic and improvement of rates on the Central road itself. That there was an increase, apart from the West Shore earnings, there is no doubt, but how great it was can only be conjectured.

The table below shows the percentage of change in the mileage, earnings, etc., for the year:

	P. c. of change.	
Mileage	Inc.	55.2
Earnings	Inc.	33.1
Net earnings	Inc.	59.6
Charges	Inc.	33.1
Profit	Inc.	140.8
Earnings per mile	Dec.	14.2
Net earnings per mile	Inc.	2.8
Profit per mile	Inc.	55.2

Here again we are met by the impossibility of determining how much of the improvement shown is due to the addition of the West Shore mileage. It is almost certain, however, that the West Shore did not add very largely to the net earnings, and that their increase was due in part to the maintenance of better through rates and in a still larger to degree to the absence of the close local competition experienced from the West Shore during the first year after the opening of that line, and to the consequent improvement in rates on the local traffic. It is altogether probable that these causes, apart from the general improvement in business, were quite sufficient to increase the net earnings by an amount more than sufficient to pay the increase in charges due to the West Shore lease.

There has been some expectation of a larger dividend for the quarter just closed, but the directors decided not to increase it and to pay only 1 per cent., carrying over the increased surplus to the new year.

Safety on the New York Elevated.

The recent rear collisions on the New York Elevated Road, two comparatively insignificant ones in a dense fog Dec. 24, and a similar one in a snowstorm before daylight Dec. 30, attracted some attention from the public, as indeed they should, though the views taken as to cause and remedy are of a very general nature, as is not usually the case where the point of observation is so distant as the public's is. The cause is taken to be the increase of business resulting from the late reduction of fares, and the remedies suggested are such as may at least be said to involve far-reaching public questions and demand much time and study for their solution, being in the nature of new problems.

But the managers of the road, if they are at all nervous on the subject, as any wide-awake manager certainly would be, desire to do something definite and immediate, and would naturally look in the direction of improved appliances or better discipline. Fogs are liable to occur again any day, and the public will flock up the stairs in just as large numbers at such times as in safer weather. They (the public) are not going to inconvenience themselves because of a slight possible danger; they are more likely to incur unnecessary or additional risk, to save a minute's time than to avoid even avoidable ones.

Discipline, which can hardly be said to be up to a reasonably high standard on many even of the best roads, would would seem to be one of the first things susceptible of improvement. These runners simply made errors of judgment; they calculated that they could stop within a distance of perhaps 50 feet, while the event showed a longer space to be necessary; or they assumed that a red light would be visible ten rods away when in reality it could not be seen more than six or eight. The rules of the road on this point are doubtless all right, but the enginemen, however good as a whole, ought to have the active aid of the management in making all their guides and standards of distance, speed, etc., uniform and trustworthy. True discipline includes these points. Commodore Vanderbilt and other "old-school" magnates selected for specially delicate or responsible trips engine runners whom they personally knew; why should not the principle here involved be more generally applied? Every one of the Elevated trains requires, in a fog, an extra good runner; why should not the management extend its acquaintance with the men down to the minute details of their working habits? More intimate intercourse between master and servant could not but be profitable, and quite likely many weaknesses might be eliminated. It is not necessary to assume that careless men would be found and have to be discharged; good men have weak points; ordinary men are succeptible of improvement by contact with minds of different training. The gap between the superintendent and his subordinates is nearly always wide—much wider than it should be—and an attempt even to bridge it always brings valuable results, in the removal of jealousies, etc.

But the block system, or something on that principle, should not be abandoned as unattainable. Discipline will not do everything; human beings will never be infallible, and all possible aid from machinery should be sought after. The hand block apparatus at the curves by which danger signals are exhibited a certain distance in advance, is worthy of more general adoption, notwithstanding the element of human forgetfulness is left by it still uneliminated. It has a great advantage over any automatic system yet tried, in that it does not cause unnecessary delays by showing danger when there is none.

It is not by any means impossible to lengthen the trains. If the station platforms were extended, eight or ten cars might, with a pushing engine, be run in each train, thus diminishing their frequency nearly or quite one-half and obviating the necessity of detaching train from engine when short of time at the termini, or the capacity of the road could be increased without increasing the frequency of trains. The well-known objections to "double-enders" have weight of course, but with perfected means of electric communication between the front and rear engines, and in view of the fact that the L road engines are of comparatively light weight and to that extent are less dangerous in the rear of a passenger train, the problem of safe running in this way seems at least very hopeful, and the elevated road, with its million of passengers, cannot afford to omit any means or relax effort in any direction in which there appears even the possibility of enhancing safety or increasing capacity with equal safety. A little collision like these is as serious a warning here as a much more frightful one would be on most roads. The reports seemed to indicate that General Manager Hain regarded these mistakes as unavoidable; that being "little ones" they should be overlooked; but we cannot believe that he bases his action on any such decision.

The Brooklyn bridge cable road must face virtually the same question. The collision that fell to its lot during the same fog, is a reminder that fair-weather brakemen are to be distrusted the same as fair-weather sailors.

An Electric Freight Brake.

The trial of the electric brake described in another column has for the first time proved the very important fact that the instantaneous and simultaneous application of brake power throughout a long loose-coupled freight train will arrest its motion without jar or shock. At the Burlington Brake Trials last summer, it was found that the shocks were very severe, and likely to prove destructive both to cars and many kinds of freight. The future development, therefore, of a brake which stops a long train without any shock will be awaited with a good deal of interest. The trial of the Park Electric Brake at Burlington last week were merely preliminary, and, therefore, developed little of interest except proving that instantaneous action avoids "bunching" the train and so propagating those violent shocks which are generally found with other forms of power brakes. With electricity the brakes can be applied simultaneously to every car in the train. With other brakes, the power is applied to each car in succession, and the hind part of the train being unretarded, crowds on the front cars on which the brakes are already on. This action is reversed when the brake is fully applied throughout the train, when the cars exert a retarding force on the engine and tender. The resulting shocks increase in violence with the length of the train. This action seems conspicuous by its absence with the electric brake as applied to a train of 25 cars. We understand that a train of 50 cars equipped with the electric brake will be present at the forthcoming tests in April. The results will be awaited with much interest, and many will be anxious to see if the longer train can be stopped without shock, and further whether an electric brake can be made to fulfill other essential requirements for freight service. It is, of course, possible that electric brakes may be found to possess some inherent disadvantages which unfit them for use. Time and experience can alone prove the fitness of electricity for this purpose, but it appears that so far, it possesses one essential qualification—simultaneous application and consequent absence of shock. In its present form many of the details are defective, but as the brake is new it would be unfair to judge it until the results of prospective improvements can be ascertained.

Mr. Simon Sterne's defense of the Cullom Inter-state commerce bill which has been published during the week past is worthy of careful consideration as representing the opinion of a trained thinker on economical subjects, and we hope to consider it more at length in a future number.

An elaborate set of designs for elevated structures has been prepared and in part patented by Mr. Edward S. Shaw, Consulting Engineer, of Boston, designed either for electrical or steam motive power. The most striking peculiarity of the design is in placing the girders within the rails, and carrying the latter on brackets on the side of the girders. The top flange of the girders then projects up between the wheels, and serve as guard-rails.

The structure seems very well designed in many ways, especially in offering the maximum of strength and security for the minimum of bulk. There is so much interest shown in Boston in the question of elevated railroads that it seems likely that the first line of that kind outside of New York and Brooklyn may be there.

State Railroad Commissioner Apthorp, of Ohio, in the recommendations included in his annual report, briefly mentioned in these columns Dec. 24, gives some very sensible reasons for the positions he takes, and states a good many important truths which legislators in Ohio, and other states as well, can profitably incorporate into the pages of their political primers. Although the commissioner's arguments are numerous, his positions, on the first three points at least, are sustained by a single fact in each case. The proposition that the state shall protect the employé from dangerous structures as carefully as it guards passengers from the same needs no other support than the following:

"The service of the train employé is no more his free choice than is the journey of the passenger. He has no better means of definitely knowing the condition of bridges, as to safety; but, like the passenger, he has a right to assume that they are safe for his train, and in this matter the state owes him as much as it does the passenger."

The fellow-servant clause has no place here. The law requiring railroads to light street crossings at night would seem to be a good candidate for abrogation on account of the difference of opinion as to its practical benefit, if for no other reason. Mr. Apthorp finds many people who regard a crossing safer when left dark. Certainly a locomotive, with a bright headlight and a good bell, can give good warning of its approach, and in some respects attracts attention better at night than by daylight. If lighting be a benefit, it is largely in its enabling pedestrians and teams to see *each other* better; and for this purpose nothing less than a powerful electric light, hung high in the air, is of much value, we suspect. A deaf person would undoubtedly derive an advantage from darkness by reason of the *changing* light thrown upon the ground and upon surrounding objects by an approaching headlight; and as careless people, for whose benefit the law is made, frequently have three or four other senses dormant, it might be well to keep in view those whose eyes are their only active sentinel. In many localities a bright light tends to prevent travelers from *seeing* an approaching train at a distance, because it draws the attention powerfully to surrounding buildings, trees, etc. Every crossing should have a very clear and conspicuous sign; and a light, if provided, should at least shine directly upon that and make it, if possible, as noticeable as in the day time. Self interest ought to impel railroads to do at least this much at all important crossings.

The law requiring all passenger trains to be stopped at every village of 3,000 or more inhabitants would seem to be a relic of stage-coach days, and require no argument to secure its repeal.

When Mr. Apthorp touches upon competing parallel railroads, he opens up a large subject, which we of course shall not discuss here. He touches the marrow of the matter, though in this extract from the report of the New York commission for 1884, which, though old, is worth repeating:

"When the state has undertaken the control of railroads by the creation of supervisory boards, and has determined to enact the highest standard of service at reasonable rates of freight and fare, it would certainly seem as if a corresponding obligation rested upon it to protect existing railroads from useless and disastrous competition by unnecessary new ones. * * * A road struggling along with disastrous competition with an unnecessary parallel road, pleads poverty and financial inability to comply with every recommendation of the board looking to better maintenance or more convenient operation. Even those measures absolutely necessary for the safety of travel are often neglected, and when recommended by the board strenuously resisted upon the ground that the road is not even earning fixed charges."

The stoutest hearted commissioner does not wish to be obliged, to use a club or a shotgun to enforce his recommendations; and nothing less potent has any effect on a general manager whose hands are tied by a poverty-scared president.

Record of New Railroad Construction.

Information of the laying of track on new railroad lines is given in the current number of the *Railroad Gazette* as follows:

Chicago, Madison & Northern.—Track laid from Freeport, Ill., north 11 miles.

Chicago, Milwaukee & St. Paul.—Additions of 154 miles at various points are reported.

Georgia Midland & Gulf.—Extended from Waverly Hall, Ga., northeast 5 miles.

Gulf, Colorado & Santa Fe.—Extended from Gainesville, Tex., north to Red River, 11 miles. The *Dallas Branch* is extended northeast to Honey Grove, Tex., 19 miles.

Kansas City, Wyandotte & Northwestern.—Extended northwest to White Church, Kan., 6 miles.

Minnesota & Northwestern.—On the *Chicago-Freeport* extension 42 miles of track are reported laid.

This is a total of 248 miles on 6 lines, making 7,274 miles reported so far for 1886. The new track reported to the corresponding date for 15 years has been:

	Miles.		Miles		Miles.
1886	7,274	1881	7,870	1876	2,278
1885	3,628	1880	6,139	1875	1,333
1884	3,834	1879	3,801	1874	1.844
1883	6,269	1878	2 263	1873	3,630
1882	10,328	1877	2,019	1872	7,160

This statement covers *main track only*, second or other additional tracks and sidings not being counted.

NEW PUBLICATIONS.

The Railway and Corporation Law Journal. Published by L. K. Strouse, New York.

We have received the first number of *The Railway and Corporation Law Journal*, edited by Chas. F. Beach and Wm. W. Cook, and published by L. K. Strouse, of New York. If subsequent numbers are anything like as good as this, it will be a paper of great value; not merely to corporation lawyers, for whom it is, of course, primarily intended, but to men in all departments of railroad administration where a knowledge of law comes into play. It will print in full, from week to week, decisions of general interest and novel importance, besides giving abstracts of a number of others, while the editorial department will contain a review of matters of current interest, both in litigation and in legislation. The new periodical appears at a fortunate time. Public interest is centred on railroad legislation as it never has been before. Two railroad cases have been recently decided by the courts, whose importance is probably greater than that of anything since the Granger cases. In *Wabash vs. Illinois*, the U. S. Supreme Court has clearly limited the rights of State legislation in the attempt to control interstate traffic In *Central Trust Co. vs. Wabash* a secure basis has been given to the right of railroad investors against certain flagrant abuses of trust. Both these decisions are given in full, besides a third case (*N. Y., L. E. & W. vs. Nickals et al.*) of somewhat less general interest affecting the rights of preferred stockholders. A large number of other topics are treated briefly. The matter is generally well selected and well edited. We only regret that the editors should have made room for a flattering notice of a book recently published by one of them. Whatever be the merits of the book—and we have no wish to detract from them—it was a mistake to publish this notice. When a journal has secured an established reputation, it can safely do a thing of this kind—but not until then. If the editors wish to give the new periodical a high character—and they obviously do—they must avoid every appearance, however slight, of making it a means for furthering their own private interests.

TRADE CATALOGUES.

Catalogue of the Marion Steam Shovel Co., Marion, O.

This very neat little pamphlet gives a full and business-like account of the construction, capacity and other details of the various steam shovels and wrecking cars, unloading plows and ditchers manufactured by the company. The latter tools are comparatively new ones in American railroad practice, and their advantages are so great for many roads which have perpetual trouble with their cuts and waste a great deal of labor in a sort of poultice work each spring, when what they really want for permanent good result is the removal of a large amount of material from the bottom of the slopes, that we feel warranted in calling special attention to them.

THE SCRAP HEAP.

Railroad Young Men's Christian Association.

According to figures and facts, the Young Men's Christian Association, Railroad Branch, in New York, is in a most joyful and flourishing condition. It celebrated its tenth anniversary last Tuesday evening, in the Grand Central Station building. Mr. Cornelius Vanderbilt sat in the presiding officer's chair, and heard with delight the roseate report of General Secretary Warburton about the effects wrought during the past year by this very admirable institution. During the twelve months 55,384 persons have visited the rooms. No less than 3,821 books were drawn from the libraries. Classes in short-hand, gymnastics and mechanical drawing are in operation. All sorts of other good facts were disclosed by Mr. Warburton, and abundant proof was offered that the Association is extraordinarily beneficial in its social, moral and mental effects.

Chauncey M. Depew was wonderfully entertaining during a long impromptu address. "It is only a matter of time," said he, "when there will be branches of our fruitful tree all over the broad land. There is, as I have often said, only one railroad in the United States anyway. That is the New York Central. There are other railroads, but they are streams to a great river. Like the great Strasburg clock, our road is wound up to run 999 years, and our educational adjunct is going to last just as long and keep on improving the railway service. This has already developed into a republic. It was a democracy in itself and a powerful force of good. The men who compose it must of necessity be men of character, intelligence and sound health, and rebuke the theories of long-haired men. The worst service that I know of is the lip service, done by men who would not work if they had an opportunity. Many of our men have found success in life by spending only 75 cents of every dollar earned and putting the balance in good securities, like New York Central stock or real estate."

The Baltimore & Ohio Collision.

The opening thunder-crash of the new year comes on the Baltimore & Ohio near Republic, Ohio, where a most disastrous collision between the west-bound express, running 60 miles an hour or faster, and a stalled east-bound freight, occurred about 2 a. m., Jan. 4, when the thermometer was below zero. The wreck immediately took fire and entirely consumed the woodwork of everything except the sleeping cars and such portion of the freight train as could be moved away by hand.

From eight to twenty-two people are believed to have perished, many of them being burned alive in the presence of the agonized survivors, who could do nothing to help them. Only six names of the killed have been reported up to the time we go to press. The details are the most heartrending we have seen for a long time. The cause appears from the first reports to be carelessness on the part of the freight conductor and engineman.

The Boston & Albany Accident.

The Boston & Albany road had its most serious accident in its history on the morning of Jan. 4, before daylight, when the Atlantic (east-bound) express, consisting of engine, 1 express, 1 baggage, 1 smoking, 1 passenger and 2 sleeping cars, and running about 45 miles an hour, was wrecked at West Springfield station, Mass., by a defective tender wheel or axle, which struck a guard rail and dropping on the track derailed the baggage car and the two cars next behind it. The engine and express car got by in safety, and the two sleepers at the rear remained on the rails. The baggage car turned to the right, struck some loaded freight cars on the side track, and rebounded so as to place itself across the east-bound main track and to crash into a west-bound freight engine standing still upon the north main track. The wreck at once took fire, and the baggage, smoking and day cars were burnt up. The passengers in the two last named escaped the fire by crawling out through the windows, with the exception of one man, believed to be a soldier of the regular army, who was burned beyond recognition. One passenger was very seriously injured and 18 other persons, including the conductor of the passenger train and apparently the fireman and one brakeman of the freight train, are reported as injured. A corpse in the baggage car was burnt up.

A Strike for Reputation.

At Lexington, Kentucky, Dec. 30, a card signed by the President of the Lexington Street Railroad Co. was published accusing certain drivers of the bob-tail cars of dishonesty, and warning passengers against paying money to the drivers. The cars started all right, but as soon as the men heard of the President's charges, they all returned to the stables and refused to work until a satisfactory explanation was made. About 1 o'clock the President, R. B. Metcalf, arrived at the stable, and, after a conference of nearly one hour with the men, promised to retract the charges and work was resumed.

Caught Him in Time.

"See here, my friend," said a policeman to a suspicious looking character, who was about to board a train, "where are you going?"

"I'm going west to start a literary magazine."

Just then two keepers hove in sight, and took him back to Bloomingdale.—*Exchange.*

Quick Children on Slow Trains.

Nearly all railroads ticket "children under 12 years at half price." But some of the railroads toward St. Louis are so slow that a boy ticketed through has to pay full fare before he reaches his destination. The Omaha *World* gives an instance where an anxious mamma asked a conductor of a St. Louis special for "the loan of his scissors until she let the hem out of her boy's trousers legs."

Pathfinders.

"What's your politics?" asked the engineer. "I'm a Prohibitionist," replied the baggageman. "That so? I didn't know you were a temperance man." "I ain't; but my shoemaker is a howling democrat and my tailor is a red-hot republican, and I want to quarrel with both of 'em." "Then you will——" "Discharge the beggars and put on two new men, non-union."

"Have you ever railroaded any?" asked the superintendent. "Oh yes," replied the candidate, "years ago. I'm an old railroader." "Where?" "Jackscorners, Kansas." The superintendent consults a map. "Why, you liar, there's no railroad running into Jackscorners." "No, I know it. They rail rode me out of it, ten year ago." He got the position of track-walker, no salary and find himself.

"Whiskey-drinking," remarked the yard-man, "is mighty bad business for somebody. I've noticed one thing about the bar traffic—all the freight goes one way and all the money the other. Every schooner is marked 'return empty.' I don't understand much about political economy, but it must be expensive for somebody when all the loads go one way and nothing but empties the other."—*Burdette, in Pathfinder Guide for January.*

In the Drawing-Room Car.

This is what is possible in the dim lamp-light of a Wagner drawing-room, when the rhythmic pulsations of the flying train produce a mawkish sentimentality in the two hearts of an eloping couple:

He—Does 'oo love 'oo ducky?
She—Eppe.
He—Tiss I den.
Both—Oh, how tweet.

Must Have a Clear Head.

"My dear young friend," he said, as he rested his chin on the back of the seat ahead and tickled the passenger's ear with his breath, "do you look upon the wine when it is red?"

"No, sir," was the reply; "I don't touch liquor in any form."

"Let me shake you by the hand, my friend. It fills my heart with unmixed joy to hear you say that. Liquor is a curse."

"It is to a man in my business. I must have a clear head."

"Railroad man?"

"No, sir; I'm a gambler."—*Judge.*

A Runaway Train.

A very serious and unusual accident is described by a traveler recently arrived here from British Columbia. He tells of a passenger train that broke loose from a locomotive while being hauled up a steep grade in Kicking Horse Pass in the Rocky Mountains. The train shot down the mountain side at an incalculable rate of speed. Striking a safety switch, the passenger car was derailed and smashed to atoms. A number of passengers were killed, while many more were badly injured. The baggage car, which contained no passengers, did not leave the track.

TECHNICAL.

Locomotive Building.

The Manchester Locomotive Works in Manchester, N.H., have recently received orders for 30 locomotives for the Atchison, Topeka & Santa Fe; 9 for the Boston & Lowell; 5 for the Minneapolis & St. Louis, and 2 for the Concord Railroad.

The Rhode Island Locomotive Works in Providence are building 5 passenger engines for the Cincinnati, New Orleans & Texas Pacific road.

The Hinkley Locomotive Co. in Boston is building 10 six-wheel connected shifting engines, with 17 by 24 in. cylinders, for the Atchison, Topeka & Santa Fe road.

The Delaware, Lackawanna & Western shops at East Buffalo, N. Y., have just completed a Mogul freight engine, with 19 by 24 in. cylinders, for the road.

The Southern Pacific shops at Sacramento, Cal., have begun to build several new engines for the road.

The New York, New Haven & Hartford shops in New Haven, Conn., are building a new mogul freight locomotive for the road.

The Car Shops.

The Detroit Car & Wheel Manufacturing Co. will commence business in April next. The company has purchased some old shops and is building two new foundries, one for car wheels and the other for general work.

The New York Central Sleeping Car Co. has just completed and put in service a very handsome new dining car, which is to run on the Michigan Central line between Rochester and Detroit.

Bridge Notes.

The shops of the Union Bridge Co., at Athens, Pa., are building the remaining spans of the new bridge over the Susquehanna at Harrisburg, Pa., for the Cumberland Valley road.

The Phœnix Iron Co., in Phœnixville, Pa., has made a contract to furnish all the steel shapes to be used in the building of the new government cruisers at Cramp & Sons' ship yard in Philadelphia. These include deck beams, angles, tees, channel, and a variety of special shapes.

Manufacturing and Business.

The Brown Hoisting & Conveying Machine Co., in Cleveland, O., have made a contract to erect extensive hoisting and conveying apparatus at the ore docks of the Lake Shore & Michigan Southern road at Ashtabula.

The Wainwright Manufacturing Co., Boston, reports the following sales of its feed-water heaters for the month of December: The Becket & McDowell Co., New York (two orders); F. S. Kazenback & Co., Trenton, N. J.; McConway, Farley & Co., Pittsburgh, Pa.; John Dunlap & Co., Philadelphia; C. W. Lyman, Somerville, Mass.; Geo. F. Blake Manufacturing Co., Boston, Mass., and a fourth order from the Cumberland & Presumpscot Mills, Cumberland Mills, Me. The company has also made shipments of its corrugated expansion joints, filters and radiators.

The Feed-Water Heater Co., of Portland, Me., at its annual meeting, Dec. 31, elected Henry Fairbanks President; E. H. Hewins, Vice-President; George S. Winn, Clerk; Charles E. Hastings, Treasurer; Charles S. Hastings, Charles H. Magoon, E. Spalding, D. B. Whittier, E. A. Hunting, George D. Burton, F. J. Rollins, Directors. The company has recently placed one of its heaters on a Portland & Ogdensburg Mogul, and one on a New York & New England Consolidation locomotive.

The Lane & Bodley Co., of Cincinnati, has been awarded the contract for a pair of 24 by 60 in. Corliss engines, 4 boilers, cable driving and tension machinery, a complete plant for two cables for the Mt. Auburn Cable Railroad of that city.

Iron and Steel.

The Edgar Thomson Steel Works, at Braddock, Pa., shut down Dec. 25, making the usual yearly stop for general repairs and adjustment of machinery.

The Pratt Coal & Iron Co., at Birmingham, Ala., has closed a contract with the Weimer Machine Works, at Lebanon, Pa., for 12 blowing engines of different sizes for the new furnaces now under construction at Birmingham.

Carnegie Brothers & Co. have decided to build a new steel rail mill at Braddock, Pa., and work on the construction of the building will be begun at once. This will increase their capacity for turning out steel rails to 400,000 tons a year.

Edge Hill Furnace, in Montgomery County, Pa., has gone into blast.

The Bellefonte Iron Co. is building a new blast furnace at Bellefonte, Pa. The furnace will burn coke and will have a capacity of 100 tons of pig iron a day.

The Rail Market.

Steel Rails.—The market is steady and very firm, although not many sales are reported for the week. Quotations are still higher, and $36.50@$37 at eastern mills are now the figures for ordinary sizes, while light rails are quoted at $39@$41, according to section.

Rail Fastenings.—The market is active, with quotations steady at 2.50 cents. per lb. for spikes in Pittsburgh; 3@3.25 for trackbolts and 1.90@2.10 for splice-bars.

Old Rails.—Old iron rails are in good demand and quotations are higher, the latest prices being $24.50@$25.50 per ton at tidewater. Old steel rails are quoted nominally at $24@$26 per ton in Pittsburgh, but are very scarce.

American Bridge-Builders' Association.

The American Bridge-Builders' Association was formed at a meeting held in New York last week. It will, it is expected, be of great benefit to all concerned in the construction of bridges, whether the engineers, contractors or those who pay for them. The Association is designed to promote open discussion among bridge engineers, so that advantageous conclusions may be arrived at in regard to the materials and methods that must be used in order to secure the best possible bridge structures. It may be readily seen how truly valuable an organization of this sort can be made. Railroad companies are enabled to obtain the scientific opinions of a careful body of men, and thus immediate and secure action is made possible.

The following parties have become members of the new association: The Union Bridge Company, Kingston Bridge Company, Edgemoor Iron Company, Detroit Bridge and Iron Works, Passaic Rolling Mill, Morse Bridge Company, Cofrode & Saylor, New Jersey Steel and Iron Company, C. J. Schultz and Phœnix Bridge Company.

The following officers were elected: A. L. Griffin, President; Willard Pope, Vice-President; Wm. H. Connell, Secretary and Treasurer.

Prizes for Good Track.

O. W. Clough, Roadmaster of the Auburn Branch of the New York Central, has received the prize of $50 for the best section of track on the road. John Ryan, one of his section foremen, received a prize of $25.

The Mogul of 1836.

In 1836 Wm. Norris, of Philadelphia, constructed what was designed to be the most powerful locomotive of its time, to be used in hauling cars over the inclined planes. This was tried in July and succeeded in ascending a plane with a rise of 196 ft. in 2,800, or 369 ft. per mile. The dimensions of this "powerful engine" were: cylinders, 10¼ × 17½ in.; No. of tubes, 78; outside diameter of tubes, 2 in.; length of tubes, 84 in.; diameter of driving wheels, 48 in.; diameter of truck wheels, 30 in. It had two driving wheels and four truck wheels; the total weight was 14,930 lbs., 8,700 lbs. of which rested on the driving wheels. The greatest load drawn by it down to the time of trial was 22 cars whose gross weight was 119 tons. In an account of the trial July 19, 1836, written by D. K. Minor for the *American Railroad Journal*, he said that the engine (after sanding some rails which had been maliciously oiled) started up the Schuylkill inclined plane (rising 196 ft. in 2,800), gaining speed steadily to the very top, which it reached in 2 min. 24 sec. "The enthusiasm of feeling cannot be described," adds Minor, "so complete a triumph had never been gained." Some of the peculiarities of the road and its working are noted in this report. The frequent and short curves are condemned, the writer apparently forgetting that the road was built to be worked by horses and not by locomotives. "Having a desire to witness during the passage the surrounding country, which is most beautiful, we scattered ourselves on the outside, but alas! we were obliged to recall our practice at ducking the head acquired on the Erie Canal. * * * The locomotive bows its chimney most respectfully to every one of the bridges, meanwhile the smoke unrestrained of the sparks fills the small space left and most effectively drenches the passenger. The practice of using but three rails for two tracks is most villainous, especially as the bridges are covered." Four-wheel cars were generally used then, but this writer says: "We returned in a large eight-wheel car, a form that is much admired." The

running time (excluding stops) from the head of the Schuylkill plane, nearly 67 miles, was 3 hours 11 minutes.

The Schuylkill plane was used until 1850, but a locomotive railroad was substituted for the Columbia plane ten years earlier.

A Three-Cylinder Locomotive.

The Dunmore Iron & Steel Co., at Dunmore, Pa., has changed the gauge of a little locomotive for use in the shop yard. This little engine has three 8 by 12 inch steam cylinders, four 33-inch driving-wheels, two outside connecting and parallel rods, and one inside connecting rod. No balancing is needed in driving wheels. The engine has six exhausts to a revolution, and the effect on the fire is good. It is claimed that by setting the cranks at an angle of 120 degrees the slip is reduced to a minimum. This engine makes 30 miles an hour on a 40-grated easily with a light load, and is considered a good machine by those who have run her. Its weight is about 12 tons.

Aluminium Bronze.

The Cowles Electric and Smelting Aluminium Co., at Lockport, N. Y., has recently placed an order with the Brush Electric Co. for three more large dynamos to be used in smelting. Of the aluminium bronze which they are now making Mr. Cowles says: "It is probably twice as strong as cast steel and stronger than rolled steel by nearly half. Another practicability of this metal, aluminium bronze, is the fact that it can be forged the same as steel or wrought iron, and will no doubt revolutionize the manufacture of large and small guns. The great drawback to the general application of this metal has been its costliness in the past, but by this method it is greatly reduced. But recently aluminium cost from $12 to $14 per pound troy weight, thus making it as costly as silver. By the Cowles process of extraction we have reduced the price, so that the actual cost per pound avoirdupois is $2.92."—*American Engineer*.

General Railroad News.

NEWS OF THE WEEK.

We give below, in a condensed form, the leading news item of the week. These items will be found in detail in their appropriate columns:

MEETINGS next week: Columbus, Hocking Valley & Toledo, Columbus, O., Jan. 11.—Philadelphia & Reading, Philadelphia, Jan. 10.—New England Railroad Club, in Boston, Jan. 12.—The Central Traffic Association met in Cincinnati, Jan. 5.—The Central Passenger Rate Committee met in Cincinnati, Jan. 4.

ELECTIONS.—Central Railroad of Georgia elects Gen. E. P. Alexander President, with a new board of directors.—Cleveland, Columbus, Cincinnati & Indianapolis elects Judge S. Burke President.—Mobile & Ohio, J. P. Whitehead Assistant General Traffic Manager.—Receiver Cooley of the Wabash lines east of the Mississippi appoints T. C. Moore General Agent; G. W. Stevens, General Manager; K. H. Wade, General Superintendent.

PERSONAL.—T. C. Moore, Joint Agent Chicago East-bound Pool, resigns.—Died: Charles E. Grover, Division Superintendent, Boston & Albany.—S. Haslett, Civil Engineer, at Brooklyn, N. Y.

EARNINGS.—December earnings are reported by 21 roads, 20 of which show increases, several of them large; only one shows a decrease.

TRAFFIC.—Associated roads of Kentucky, Tennessee and Alabama will continue the organization.—Brooklyn Bridge carries 27,436,707 passengers during 1886.—In the Central Traffic Association 59 roads vote to abolish passenger commissions, 1 against and 16 are undecided.—Coal tonnage for the week: Anthracite, 578,743; Eastern bituminous, 249,344; coke, 71,846.—Cotton receipts, four months to Dec. 31, at interior markets, 2,499,730; seaports, 3,755,798. Total cotton in sight Dec. 31 was 4,577,669 bales.—Delaware & Hudson Canal Co. reduces local fares on its Northern lines 25 per cent.—Dressed meat and live stock shippers have a hearing before Commissioner Fink.—Pig iron production for 1886 was 5,600,000 tons; steel rails, 1,500,000 tons.

CHANGES AND EXTENSIONS.—Chicago, Milwaukee & St. Paul built 422 miles of new road in 1886.—Chicago, Santa Fe & California will bridge the Mississippi at Fort Madison, Ia.—Forth Worth & Denver begins work on extension to the Canadian River.—Fort Worth & Rio Grande has begun grading from Fort Worth, Tex., to Granbury.—Missouri Pacific will build extensions to Waco and Houston, Tex.; also Boonville Branch to Lexington, Mo.—Nashville, Chattanooga & St. Louis will extend branch to Florence, Ala.—St. Louis, Arkansas & Texas will build branch from Fisher, Ark., to Newport.—Santa Rosa & Benicia Central begins work at Benicia, Cal.—Texas & Pacific begins branch from Strawn, Tex., to coal mines.—Versailles & Midway will extend from Versailles, Ky., to Lawrenceburg.

LEASES, SALES, ETC.—Boston & Lowell offers to lease Connecticut & Passumpsic Rivers road.—Illinois Central buys Havana, Rantoul & Eastern road, 76 miles.—Indianapolis, Peru & Chicago will continue to be worked in conjunction with the Wabash.—Little Rock & Fort Smith passes to Jay Gould by sale of a majority of the stock.—New Jersey Central Receivers take possession of the road Jan 1.—South Pacific Coast reported sale to Southern Pacific Co. denied.—Wabash, St. Louis & Pacific lines east of the Mississippi pass under control of Judge Cooley, Receiver.

FORECLOSURES AND REORGANIZATIONS.—Missisquoi road passes to Missisquoi Valley Co. under a strict foreclosure.—New York, Chicago & St. Louis first mortgage decided to be invalid by Ohio Court of Common Pleas. The case will be appealed to the Supreme Court.

NEW COMPANIES ORGANIZED.—Chicago & Southwestern at Chicago.—Nebraska, Kansas & Texas, at Oberlin, Kan.—Nebraska, Kansas & Cimarron River, at Topeka, Kan.—St. Louis & Southeastern, at Chester, Ill.—Sheffield & Seaboard, at Sheffield, Ala.—Tennessee Midland, at Memphis, Tenn.

REPORTS AND FINANCIAL.—Cleveland, Columbus, Cincinnati & Indianapolis for 1886 gained 13 per cent. gross and 66 net. Surplus over all charges equal to 0.7 per cent. on stock.—Denver & Rio Grande earned for 1886 gross, $6,764,995; net, $2,506,980.—Lake Shore & Michigan Southern for 1886 shows increase of 12 per cent. gross and 26 net. Surplus over fixed charges equals 4.84 per cent. on stock.—Michigan Central for 1886 gained 14 per cent. gross and 45 net. Surplus over all charges equaled 4.87 per cent. on Michigan Central stock and 2.73 per cent. on Canada Southern.—New York Central & Hudson River for quarter ending Dec. 31 shows increase of 30½ per cent. gross and 30½ net. Surplus equals 1.81 per cent. on stock.

MEETINGS AND ANNOUNCEMENTS.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Columbus, Hocking Valley & Toledo, annual meeting, at the office in Columbus, O., Jan. 11.

Connecticut River, annual meeting, at the office in Springfield, Mass., Jan. 19.

Illinois Central, special meeting, at the office in Chicago, Jan. 18.

Lehigh Valley, annual meeting, at the office in Philadelphia, at noon on Jan. 18.

Philadelphia & Reading, annual meeting, at Association Hall, Philadelphia, at noon on Jan. 10.

Providence & Worcester, annual meeting, at the office in Providence, R. I., at 10 a. m. on Feb. 7.

St. Joseph & Grand Island, special meeting at Elwood, Kan., Jan. 26.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Atchison, Topeka & Santa Fe, 1½ per cent., quarterly, payable Feb. 15, to stockholders of record on Jan. 10.

Canada Southern, 1¼ per cent., payable Feb. 15, to stockholders of record on Jan. 15.

Delaware, Lackawanna & Western, 1¾ per cent., quarterly, payable Jan. 20, to stockholders of record on Jan. 5.

Lake Shore & Michigan Southern, 2 per cent., payable Feb. 15, to stockholders of record on Jan. 15.

Long Island, 1 per cent., quarterly, payable Feb. 1, to stockholders of record on Jan. 8.

Michigan Central, 2 per cent., payable Feb. 15, to stockholders of record on Jan. 15.

Nashville, Chattanooga & St. Louis, 1 per cent., payable Jan. 10, to stockholders of record on Jan. 6.

New York Central & Hudson River, 1 per cent., quarterly payable Jan. 15, to stockholders of record on Dec. 31.

Pittsburgh, Fort Wayne & Chicago, 1¾ per cent., quarterly, payable Jan. 3 on special stock; Jan. 5 on regular stock.

Terre Haute & Indianapolis, 3 per cent., semi-annual, payable Feb. 1, to stockholders of record on Dec. 31.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Society of Civil Engineers* will hold its annual meeting at the Society's House in New York, beginning on Wednesday, Jan. 19.

The *Master Car-Builders' Club* holds its regular meetings at the rooms, No. 113 Liberty street, New York, on the third Thursday in each month.

The *New England Railroad Club* holds its regular meetings at its rooms in the Boston & Albany passenger station in Boston, on the second Wednesday of each month.

The *Western Railway Club* holds its regular meetings at its rooms in Chicago on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.

Foreclosure Sales.

The *Omaha Division* of the *Wabash, St. Louis & Pacific* road was sold under foreclosure in Omaha, Neb., Dec. 28, and was bought in for $1,400,000, by Mr. E. W. Sheldon, of New York, acting as agent for the bondholders. The road extends from Council Bluffs, Ia., to the Missouri state line, 143 miles, and has been part of the Wabash system.

The *Cincinnati & Eastern* road was resold in Cincinnati, Jan. 5, and bought for $1,000,000 for the Ohio & Northwestern Co., a new corporation organized by Cincinnati parties.

The *Little Rock, Mississippi River & Texas* road, under the decision of the Court, will be resold in Little Rock, Ark., Jan 15.

Boston & Maine Relief Association.

The annual meeting was held in Boston this week, with a large attendance of members. Secretary Ingalls read his reports, which stated that there was in the treasury Jan. 1, 1886, $1,545; received during the year, $6,779, including $1,167 from a ball given in February. There have been paid $1,578 in death benefits, and $1,580 for sick benefits. Balance on hand Jan. 1, 1887, $4,525. There were 343 members at the beginning of 1886, present membership 888.

American Institute of Mining Engineers.

The Forty-seventh (annual) meeting of the Institute will be held at Scranton, Pa., beginning Tuesday evening, Feb. 15, 1887. Communications concerning arrangements, rooms, etc., may be addressed to Mr. E. S. Moffat, Chairman of the Local Committee.

Hotel headquarters will be at the Wyoming Hotel; rate, $3 per day. No special railroad facilities will be furnished for this meeting.

The programme for the meeting will include visits to steel works, machine-shops and collieries. There will be a subscription dinner on Friday evening, February 18, at the Wyoming Hotel.

Members desiring to present papers at this meeting are requested to notify the Secretary (not the Local Committee) as soon as possible, and to send at an early day either the papers in full, or such an abstract or description of them as will enable the Council to judge of their nature and length, the number and size of illustrative drawings, etc.

The Secretary announces that President Richards, who has been, since the St. Louis meeting, very ill with typhoid fever, is rapidly recovering strength, and hopes to be present at the Scranton meeting.

Pennsylvania Railroad Relief Department.

The following statement is issued of the operations of the Pennsylvania Railroad Relief Department for the month of November:

	Amount.
Death benefits	$15,672
Accident "	3,374
Sickness "	5,881
Total	$24,927

The death benefits paid from Feb. 15 to Nov. 30 were 128, accident benefits 1,437, sick benefits 3,024. The sick and accident benefits ranged from 40 cents to $60, and the death benefits from $250 to $2,500.

Western Railway Club.

Next meeting of this Club will be held in the Grand Pacific Hotel, Chicago, Jan. 19, at 2 p. m.

The subjects for discussion are:

1. Weight of Driving Wheels and Tires; to be introduced by Mr. C. E. Smart.

Mr. Smart believes that a large proportion of the rapid wear of driving wheel tires and rails is due to abrasion caused by the ponderous rigid weight of driving wheels and tires. He favors reducing the weight of driving wheels and tires and transferring it, if necessary, to the boiler or frames where springs would intervene to soften its shock. Facts bearing on this subject are scarce. Any one having information about it, who cannot attend the meeting, would confer a favor on the Club by communicating the same to the Secretary in writing.

2. Rules of Interchange of Cars Nos. 12, 13 and 14; Mr. G. W. Rhodes will introduce the subject.

Baltimore & Ohio Employes' Relief Association.

The November sheet of this Association notes payment of benefits during the month as follows:

	Number.	Amount.	Average.
Accidental death	5	$5,500	$1,100.00
Natural death	8	3,200	400.00
Accidental injuries	301	3,604	11.97
Natural sickness	518	8,194	15.82
Physicians' bills	122	911	7.40
Total	954	$21,409	$22.44

The members to whom these benefits were paid were divided as follows: Main Stem, Transportation Department, 214; Machinery Department, 213; Road Department, 128; Philadelphia Division, 48; Trans-Ohio divisions, 162; Pittsburgh Division, 67; physicians' bills (not classified by divisions), 122; total, 954.

Transportation in Congress.

In the Senate on the 5th:

A message was received from the Secretary of War, transmitting a report on the Baltimore & Ohio's proposed bridge over the Arthur Kill. The report recommends a channel span of 450 ft. clear opening, a draw with 125 ft. openings and a minimum height of 50 ft. above high water. Referred.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—The following changes in divisions took effect Jan. 1: The Eastern Division will extend from Kansas City and Atchison to Newton, including the Leavenworth, Topeka & Southwestern Railway, the Manhattan, Alma & Burlingame Railway, the Howard, Douglass and McPherson branches, and the Osage City and Little River extensions of the Chicago, Kansas & Western Railroad. The Middle Division will extend from Newton to Dodge City, including Newton and Dodge City yards, the Caldwell and Arkansas City branches, and the Hutchinson, Great Bend and Larned extensions of the Chicago, Kansas & Western Railroad.

The following appointments are made, to take effect Jan. 1, Mr. H. P. Reigart, Assistant to the General Superintendent, with office at Topeka, Kan. Mr. C. L. Nichols, Superintendent of the Eastern Division, with office at Topeka, Kan. Mr. N. T. Spoor, Assistant Superintendent in charge of terminal facilities at Kansas City and Argentine, with office a Kansas City, Mo.

The New England freight and passenger office of this company will remove Jan. 15, 1887, to 332 Washington street, Boston (near Milk street), where Mr. S. W. Manning, New England Agent, may be addressed after that date.

Boston & Lowell.—This company held its annual meeting in Boston on Jan. 5, and re-elected its old board.

Boston & Maine Relief Association.—Officers have been elected as follows: President, D. W. Sanborn; Vice-President, Augustus Colby; Secretary and Treasurer, A. A. Ingalls; directors, D. W. Sanborn, Augustus Colby, William E. Meade, William H. Hogue, John Hunnewell, J. A. Prescott, A. A. Howe, Arthur Pickering, D. A. Smith, E. E. Foye, W. H. Hatch; Finance Committee, J. N. Macdonald, E. A. Maxfield, N. E. Cate.

Central Railroad & Banking Co., of Georgia.—At the annual election in Savannah, Jan. 3, the following were elected: President, Gen. E. P. Alexander; Directors, Henry Blun, J. K. Garnett, E. M. Green, A. E. Mills, Abraham Vetsburg, J. J. Wilder, C. R. Woods, Savannah, Ga.; C. H. Phinizey, Augusta, Ga.; Patrick Calhoun, Atlanta, Ga.; N. B. Harrold, Americus, Ga.; John C. Calhoun, H. B. Hollins, New York. This is a complete change, the opposition party having elected its ticket and put in an entirely new management.

Central Vermont.—Mr. John Porteous has been appointed General Traffic Manager in charge of all through traffic, in place of Lansing Millis, deceased. He will have his office in Boston. Mr. Porteous was recently on the Grand Trunk road.

Chicago, Burlington & Quincy.—Mr. W. M. Shaw has been appointed Traveling Passenger Agent for this company, with headquarters at 249 West Fourth street, Cincinnati, O. This appointment took effect Jan. 1, 1887.

Chicago, Kansas & Nebraska.—The directors of this company are: F. M. Darrah, C. W. Jones, E. S. Conwell, S. S. Brown, G. W. Samuel, H. A. Parker and M. A. Low.

Chicago & Southwestern.—The directors of this new company are: Robert D. McFadon, Ralph E. Beebe, John W. Ramsey, Oliver G. Fessenden and James P. Gardner, all of Chicago.

Cincinnati, New Orleans & Texas Pacific.—Mr. Charles B. Gray has been appointed Assistant General Passenger Agent.

Cleveland, Columbus, Cincinnati & Indianapolis.—Judge Stevenson Burke, of Cleveland, O., has been chosen President in place of Gen. J. H. Devereux, deceased. Judge Burke has been Vice-President for some time.

Cleveland & Pittsburg.—The following board of directors was chosen at the annual meeting of this company's stockholders at Cleveland, Jan. 5: J. N. McCullough, B. F. Jones, Pittsburg; George B. Roberts, William Bucknell, Philadelphia; Charles Lanier, William C. Egleston, New York; E. A. Ferguson, Cincinnati; J. V. Painter, E. R. Perkins, R. P. Ranney, R. F. Smith, Cleveland, and W. W. Holloway, Bridgeport, O.

East Tennessee, Virginia & Georgia.—The following order from Superintendent of Motive Power W. H. Thomas is dated Knoxville, Dec. 27: "Mr. J. B. Michael is appointed Master Mechanic of the East Tennessee Division, vice Mr. B. J. Sitton, resigned to accept a position on another road. He will have charge of both Locomotive and Car departments, with headquarters at Knoxville, Tenn. Mr. C. L. Petrikin

is appointed Master Mechanic of the Alabama Division, vice Mr. J. B. Michael transferred, with headquarters at Selma, Ala. Appointments to take effect Jan. 1, 1887."

Georgia Midland & Gulf.—Mr. M. E. Gray, Treasurer, has been appointed General Superintendent also.

Grand Rapids & Indiana.—Mr. H. D. C. Van Asmus having resigned as Contracting Agent for this company to enter other service, Mr. F. T. Rand has been appointed Contracting Agent, with office at 93 Monroe street, Grand Rapids. Mr. E. Baker has been appointed Traveling Freight Agent, with headquarters at Grand Rapids, vice C. F. Clugston, transferred.

Long Island.—Mr. Charles M. Heald having resigned the position of General Traffic Manager, the duties of that office will be performed by Assistant Superintendent Benjamin Norton, who will have general charge of traffic matters. Mr. H. M. Smith is appointed Assistant General Traffic Manager.

Louisville, New Orleans & Texas.—Mr. J. A. Baldwin is appointed Master of Trains, with office in Vicksburg, Miss. He was recently on the Georgia Pacific road.

Manitoba Railway Construction Co.—The provisional directors are D. S. McKay, Peter M. Morrison, Alex. McIntyre, J. H. G. Munson and C. S. Hoare.

Memphis & Nashville.—The incorporators are: T. C. Leake, Jr., A. S. Buford, J. B. Pace, E. D. Christian, R. H. Temple, Thos. C. Williams, Charles Walkins, James T. Gray and W. Montague, of Richmond, Va.; A. L. Crawford, of New Castle, Pa.; J. M. Hamilton and Nathaniel Baxter, of Nashville, and W. D. Bethel, Napoleon Hill and John Overton, Jr., of Memphis.

Mobile & Ohio.—Mr. T. J. Whitehead, late Agent of the St. Louis Coal Pool, has been appointed Assistant General Traffic Manager of this road.

Nebraska, Kansas & Cimarron River.—The directors of the new company are: George Sellers, G. P. Guerner, J. M. Johnson, I. H. Paressler, H. H. Wagner and H. E. Bell, Kendall, Kan.; C. A. Schneider, Garden City, Kan.; Samuel Guerner and C. C. Burnes, Atchison, Kan.

Nebraska, Kansas & Texas.—The directors of the new company are: J. B. Hitchcock, C. E. Chandler, G. F. Bogue, W. A. Frazier, Tully Scott, A. L. Patchin, D. C. Moser and L. G. Baker, Oberlin, Kan.; J. W. Huff, Hoxie, Kan.; J. B. Beal, Grainfield, Kan.; L. S. Steele, Ravenna, Kan.; G. M. Hoover, Dodge City, Kan.; J. O. Mesava, Mede Centre, Kan.; Jos. McConnell, Forte Platte, Neb.; George Hocknell, McCook, Neb.

New York Central Sleeping Car Co.—At the recent board meeting of directors held in New York, H. W. Webb, formerly Assistant to the President, was elected Vice-President of this company. L. W. Devenpeck, Agent at Montreal, was appointed District Superintendent, vice Oscar Eastmond, resigned. His will be the Weehawken district. Conductor T. C. Clark was appointed Agent at Montreal.

New York, Lake Erie & Western.—The following from First Vice-President S. M. Felton, Jr., is dated New York, Dec. 27: "Taking effect Jan. 1, 1887, the organization for the distribution and charge of the freight equipment of this company will be as follows: B. Thomas, General Superintendent, N. Y., L. E. & W. R. R., Jersey City, N. J., will have the distribution and charge of, and be responsible for the movement of New York, Lake Erie & Western, New York, Pennsylvania & Ohio, Buffalo & Southwestern, New York & Greenwood Lake, and Tioga cars, on line of the N. Y., L. E. & W. R. R. and eastern connections, Michigan Central east of Detroit River, and Grand Trunk Railway of Canada and its Canadian connections. Junction cards should be addressed to G. K. Cooke, Car Accountant, N. Y., L. E. & W. R. R. Co., Jersey City, N. J.

"J. R. Shaler, General Superintendent, N. Y., P. & O. R. R., Cleveland, Ohio, will have the distribution and charge of, and be responsible for the movement of New York, Lake Erie & Western, New York, Pennsylvania & Ohio, Buffalo & Southwestern, New York & Greenwood Lake, and Tioga cars, on line of the N. Y., P. & O. R. R. and connections west of the N. Y., L. E. & W. R. R., excluding railroads west of N. Y., P. & O. R. R. Western terminals. Junction cards should be addressed to B. L. Babb, Car Accountant, N. Y., P. & O. R. R., Cleveland, Ohio.

"Geo. W. Ristine, Assistant Freight Traffic Manager, Chicago, will have the distribution and charge of and be responsible for the movement of New York, Lake Erie & Western and New York, Pennsylvania & Ohio cars west of N. Y., P. & O. R. R. western terminals, viz.: Cleveland, Creston, Galion, Marion, Mansfield, Urbana, Springfield, Dayton and Cincinnati, including L. S. & M. S. Ry. and N. Y., C. & St. L. Ry., and their connections west of Buffalo, and the Michigan Central R. R. west of Detroit River. Junction cards should be addressed to C. W. Barnes, General Western Agent, the Railway Car Association, 205 La Salle street, Chicago.

"All cars belonging to these companies marked 'Erie Despatch,' 'Great Western Despatch,' 'Erie & Pacific Despatch,' 'South Shore Line,' will be under the supervision and charge of Geo. W. Ristine, General Manager, Erie Despatch, Chicago. Junction cards, without regard to division of territory as specified above, should be addressed to C. W. Barnes, General Western Agent, the Railway Car Association, 205 La Salle Street, Chicago.

"Cars marked 'N. Y., L. E. & W. R. R.,' 'N. Y. & G. L. Ry.,' and 'Tioga R. R.' (whether line or common), send mileage reports as per equipment list, in separate items, to G. K. Cooke, Car Accountant, N. Y., L. E. & W. R. R., Jersey City, N. J. Remit to Edward White, Treasurer, 21 Cortlandt Street, New York.

"Cars marked 'N. Y., P. & O. R. R.' and 'B. & S. W. R. R.' (whether line or common), send mileage reports as per equipment list, in separate items, to B. L. Babb, Car Accountant, N. Y., P. & O. R. R., Cleveland, Ohio. Remit to Edward White, Treasurer, 21 Cortlandt street, New York.

"Railroad companies are respectfully asked to comply with the requests of the officer named in the territory assigned, for the prompt movement and distribution of the freight equipment of these companies."

Northern Pacific.—The following changes have occurred among the telegraph operators of this line: J. Harper goes from Miles City to Missoula, on Rocky Mountain Division, and his place is taken by W. A. Umbarger. J. A. Winn has gone to Little Rock, Arkansas, from Glendive, and H. P. Clarke, from Huntley Station, relieves him. L. E. Westrope goes to Huntley from New Richmond, Wisconsin. E. P. Coltman goes from Forsythe to Pocatello, on the Union Pacific, and is relieved by J. W. Mangle, transferred from Rosebud Station. S. W. Lehman relieves J. W. Mangle at Rosebud.

Old Colony.—Mr. George L. Connor has been appointed General Passenger and Ticket Agent vice Mr. Jacob Sprague, Jr., transferred. Mr. Connor will continue as General Passenger Agent of the Old Colony Steamboat Co. and Fall River line, and all matters relating to the passenger ticket department of either company will be under his charge. The appointment took effect Jan. 1,

Mr. Jacob Sprague, Jr., is appointed Auditor of Passenger Accounts of this company and also of the Old Colony Steamboat Co., with headquarters at Boston. Reports of ticket sales by agents and foreign lines should be made to him. This appointment takes effect Jan. 1.

Pennsylvania.—Mr. George M. Roberts has been appointed the New England Passenger Agent, with office in Boston, in place of Mr. L. P. Farmer, who has gone to the Erie.

Pennsylvania Company.—Mr. Samuel Moody is appointed District Passenger Agent, with office in Pittsburgh. This is a new appointment, the Pittsburgh District being now set off as an independent district for the first time.

Philadelphia & Reading.—Mr. Samuel Garwood is appointed Superintendent of the Philadelphia & Atlantic City Railroad, and the Camden, Gloucester & Mt. Ephraim Railway, vice W. Bertolet, assigned to other duties.

Mr. Charles M. Heald is appointed Superintendent of the Philadelphia & Reading Express. He was recently on the Long Island road.

Rome, Watertown & Ogdensburg.—At the annual meeting in New York last week the old directors and officers were re-elected.

St. Louis & Southeastern.—The incorporators are: E. C. Dawes, Cincinnati, O.; J. E. McGettigan and C. W. Fairbanks, Indianapolis, Ind.; E. F. A. Chapman, Murphysboro, Ill., and Samuel T. Brush, R. J. Cavett and J. M. Richards, Carbondale, Ill.

Tennessee Midland.—The incorporators are: T. C. Leake, Jr., A. S. Buford, J. B. Pace, E. D. Christian, R. H. Temple, Thos. C. Williams, Charles Walkins, James T. Gray and W. Montague, Richmond, Va.; A. L. Crawford, of New Castle, Pa.; J. M. Hamilton and Nathaniel Baxter, Nashville, Tenn.; W. D. Bethel, Napoleon Hill, John Overton, Jr., of Memphis, Tenn.

Terre Haute & Indianapolis.—At the annual meeting in Terre Haute, Ind., Jan. 3, the following directors were chosen: W. R. McKeen, Henry Ross, D. W. Minshall, Josephus Collett, F. C. Crawford, George E. Farrington, John G. Williams. The board elected W. R. McKeen President; George E. Farrington, Secretary; John W. Craft, Treasurer.

Terre Haute & Logansport.—At the annual meeting, Jan. 3, the following directors were chosen: W. R. McKeen, D. W. Minshall, Frank McKeen, John G. Williams, George E. Farrington. The board elected W. R. McKeen President; George E. Farrington, Secretary and Treasurer.

Wabash, St. Louis & Pacific.—Judge T. M. Cooley, as Receiver of the lines east of the Mississippi, has made the following appointments: General Agent and Secretary, F. C. Moore; General Manager, G. W. Stevens; General Superintendent, K. H. Wade; General Passenger Agent, Samuel W. Snow; General Freight Agent, Wm. Duncan; Treasurer, W. B. Corneau; Auditor, F. I. Whitney.

It is not yet certain whether Mr. Duncan will accept the office tendered him, or whether he will prefer to retain his present position on the Ohio & Mississippi. Mr. Moore has been Agent of the Chicago East-bound Pool, and Mr. Snow has been on the Chicago & Atlantic. The other officers have been with the Wabash for a long time.

PERSONAL.

—Mr. Joseph W. Reinhart has left the Lake Shore road to accept a position with the Richmond & Danville.

—Mr. P. D. Cooper, for many years General Manager of the New York, Pennsylvania & Ohio, is considered hopelessly ill at De Land, Fla.

—Mr. S. T. McLaughlin, General Manager of the Continental Line, has been presented with a handsome silver ice set by friends in Buffalo.

—Mr. Charles P. Clark, late President of the New York & New England Co., sails from New York this week for a trip to Europe, which will extend over several months.

—Mr. James B. Barnes has just married Mrs. Ann Shryock at Fort Wayne, Ind. Mr. Barnes is Superintendent of Motive Power and Machinery of the Wabash, St. Louis & Pacific.

—Mr. C. B. Squire, Passenger Agent of the Cleveland, Akron & Columbus road at Cleveland, O., has resigned to accept a position with the Atchison, Topeka & Santa Fe at Buffalo, N. Y.

—Mr. J. T. Edwards, Master Mechanic of the Owensboro & Nashville, has resigned on account of ill health. He was presented with a testimonial and a diamond ring by the road employés.

—Mr. T. C. Moore has resigned the position of Joint Agent of the Chicago Committee of the Central Traffic Association to act as Secretary for Judge T. M. Cooley, the new Receiver of the Wabash Road.

—Mr. J. H. Travis, Master Bridge Builder of the Central Iowa road, has resigned, and will accept a similar position on the Iron Mountain Division of the Missouri Pacific road. His address will be at Marshall, Texas.

—Mr. Lucius Tuttle, who leaves the Boston & Lowell road to take charge of the Passenger Department of the Canadian Pacific, was presented on Dec. 27 by the passenger employés of this old road with a china set of fifteen pieces.

—Mr. Peter F. Clinton died of consumption at San Bernardino, Cal., Dec. 20. He was the Division Superintendent of the Kansas City, Fort Scott & Gulf road at Kansas City till his ill-health compelled him to resign in August last.

—Mr. W. H. Wait, Stationmaster of the New York Central at Syracuse, recently celebrated the 32d anniversary of his service with the company. He entered the service of the road at Suspension Bridge, and has been at Syracuse since 1861.

—On account of increased duties in connection with car service on the Baltimore & Ohio Railroad, Mr. D. F. Maroney has resigned the position of Car Service Agent, Pittsburgh & Toledo Dispatch, and Car Accountant, Pittsburgh & Western Railroad, taking effect Jan. 1.

—Gen. E. P. Alexander, the well-known railroad man, who is just now the opposition candidate for the presidency of the Central Railroad Co. of Georgia, is the author of an article in the *Century Magazine* for January on the battle of Gettysburg as seen from the Confederate side.

—Mr. G. A. Haggerty, Mechanical Superintendent of the New Brunswick Railway Co., was fortunate enough to have the holidays brightened by appreciative tokens of regard from the road employés. A gold headed cane and a set of furs were among the gifts received by Mr. Haggerty.

—Mr. J. A. Baldwin has resigned his position as Chief Train Dispatcher of the line between Atlanta, Ga., and Austell, which is used jointly by the East Tennessee, Virginia & Georgia and the Georgia Pacific roads, to accept a position on the Louisville, New Orleans & Texas road. His associates on the old line presented him with a handsome gold-headed cane.

—Mr. Charles E. Grover, Division Superintendent on the Boston & Albany road, died at his residence in Springfield, Mass., Dec. 31, aged 40 years. Mr. Grover began his service on the road at an early age as a water-boy on a passenger train, and was promoted through the grades of passenger brakeman, conductor and station agent until he was appointed Division Superintendent in 1880. His death was caused by pneumonia, and he was ill only a few days.

—A correspondent writes: "The engineers on the Kansas City, Memphis & Birmingham spent a very pleasant Christmas in Tupelo, Miss., quite a number from the line being present. On Thursday evening, Dec. 24, Capt. A. W. Gloster, Principal Assistant Engineer, gave them a complimentary party, and during the evening Capt. Gloster was presented with a very fine double-barreled breech-loading shotgun by Mr. W. B. Cranshaw, in behalf of the resident engineers, and at the same time the assistant engineers presented Mrs. Gloster with a beautiful and costly silver water service. The presentation was made by Mr. J. W. Grans, Assistant Engineer, in a very happy little speech. On Friday night the engineers and their families residing here had a very fine Christmas tree, after that a dance. On Saturday (Christmas) all of the visiting engineers partook of a fine dinner given by Capt. F. J. Aid, Division Engineer, and F. Mathews, engineer in charge of office. On Sunday all attended church in a body, and on Sunday night all left for their posts as happy a lot of engineers as were ever seen."

—Mr. Sullivan Haslett died at his residence in Brooklyn, N. Y., Jan. 4, aged 43 years. Mr. Haslett was born in Brooklyn, his father being a surgeon in the United States Navy, and was educated in that city and at Harvard College, and after graduating studied for three years in France and Germany. His first employment as a civil engineer was under General Steward in making the general survey for the West Shore road. After leaving that road he was for several years Division Engineer on the New Haven, Middletown & Willemantic and on the Boston water-works. His next employment was as Resident Engineer at the Phœnixville Bridge Works, where he was employed in the construction of the Metropolitan Elevated road for New York. Subsequently he was Chief Engineer for a time for the Toledo, Cincinnati & St. Louis, and more lately of the Chatauqua Lake road. He was a member of the firm of Haslett & Van Horne, civil engineers, and also of the contracting firm of C. O. Richards & Co., of New York. He was a member of the American Society of Civil Engineers, and always took an active part in the proceedings. Mr. Haslett was regarded as a civil engineer of more than usual ability, and his death will be mourned by a large circle of friends.

TRAFFIC AND EARNINGS.

Cotton.

Cotton movement for the four months of the crop year from Sept. 1 to Dec. 31 is reported by the *Commercial and Financial Chronicle* as follows, in bales:

Interior markets:	1886.	1885.	Inc. or Dec.	P.c.
Receipts	2,490,730	2,509,202	D. 9,472	0.4
Shipments	2,104,225	1,981,495	I. 122,730	6.2
Stock, Dec. 31	443,563	543,557	D. 99,992	18.4
Seaports:				
Receipts	3,755,798	3,607,242	I. 148,556	4.1
Exports	2,297,034	2,017,698	I. 279,336	13.8
Stock, Dec. 31	1,118,884	1,131,538	D. 12,654	1.1

It must be remembered that a considerable part of the shipments from interior markets reappears in the seaport receipts.

The *Chronicle* says: "In the table below we give the receipts from plantations, and add to them the net overland movement to Dec. 1, and also the takings by southern spinners to the same date, so as to give substantially the amount of cotton now in sight.

	1886.	1885.	1884.	1883.
Receipts at the ports to Dec. 31	3,755,798	3,607,242	3,691,516	3,556,962
Interior stocks on Dec. 31 in excess of Sept. 1	395,505	527,707	332,273	358,818
Total receipts from plantations	4,151,303	4,134,949	4,023,789	3,915,780
Net overland to Dec. 1	321,366	341,137	227,855	261,252
Southern consumption to Dec. 1	105,000	89,000	78,000	87,000
Total in sight Dec. 31	4,577,669	4,565,086	4,329,644	4,264,032
Northern spinners' takings to Dec. 31	817,629	914,110	683,161	908,913

"It will be seen by the above that the increase in amount in sight to-night, as compared with last year, is 12,583 bales, the increase as compared with 1884 is 248,025 bales and the increase over 1883 is 313,637 bales."

Middle States Association.

A meeting of the Freight Traffic Association of the Middle States was held at Commissioner Fink's office in New York on Jan. 4. No business of general importance was transacted.

Associated Roads of Kentucky, Alabama and Tennessee.

The Board of Control of this Association met at Louisville on Jan. 4. It has been thought that owing to serious disagreements regarding the division of earnings which have arisen during the past year, that the association would be dissolved, but the indications now are that it will be continued under a revised agreement.

Awards in Lime, Cement and Lumber Pools.

Commissioner J. N. Faithorn, of the Western Traffic Association, has made, as arbitrator, the following awards in the lime and cement and the lumber pools. The allotments include all competitive business on the roads mentioned, originating east of the Missouri River and destined for Omaha and points beyond. The awards are as follows:

	Lumber.	Lime, etc.		Lumber.	Lime, etc.
Burlington	24	29	Kansas City, St. Jo. & Council Bluffs	1	2
St. Paul	25	14	Wabash	6	11
Northwestern	14½	14	Missouri Pacific	9	8
Rock Island	10	16	Omaha	10½	6

This traffic is of considerable importance.

Central Traffic Association.

Geo. R. Blanchard, Commissioner of the Central Traffic Association, issues to the roads in the Association a circular, stating, in regard to the letter ballot on the question of abolishing commissions after Jan. 1, 1887, that out of 76 companies, 59 are substantially in favor, one votes "no" and 16 are still consulting with competitors and connections. Mr. Blanchard regards 11 of the 16 as unessential to the reform and the solitary objection being a short road and hay-

ing added a slightly encouraging qualification to its vote, he thinks the discussion likely to speedily result in substantial agreement; and says that a mass-meeting of the lines in interest could, if held during the present month, undoubtedly inaugurate the reform on Feb. 1, as suggested in the original resolution of the association.

Railroad Earnings.

Earnings of railroad lines for various periods are reported as follows:

	1886.	1885.	Inc. or Dec.	P. c.
Year to Dec. 31:				
Canadian Pac....	$10,050,416	$8 356,283	I. $1,694,133	20.9
Chic. & Alton....	8,019,452	7,893.169	I. 126.283	1.6
Chic. & Atlantic..	1,655,033	1,346,313	I. 308,720	22.9
Chi. & East. Ill..	1,769,287	1,673,940	I. 95,347	5.6
Chi., Mil. & St. P.	24,719,876	24,413,374	I. 306 502	1.3
Ci., C., C. & I....	7,228,385	6,411.445	I. 816,940	12.7
Net earnings...	2.461,992	1,482,171	I. 979,421	66.1
Denver & R. G....	6,764,995	6,119,054	I. 645,941	10.6
Net earnings....	2,506,980	2,183,780	I. 323.200	15.0
Ev. & Terre H....	750,018	727,124	I. 22,894	3.1
Lake S. & M. S...	15,826,616	14,133,506	I. 1,693,110	11.9
Net earnings...	6,117,481	4,845,969	I. 1,271.512	26 2
Long Island.....	2 992,019	2,842,984	I. 149,035	5.2
Louis. & Nash. ..	13,993,864	13,675 902	I. 317,962	2.3
Lou., N A. & C.	1,881.260	1,683,653	I. 197,607	11.7
Mexican Central .	3,853.415	3,549,544	I. 303,871	8.6
Michigan Central.	12,250,000	10,707,394	I. 1,542,606	14.1
Net earnings....	3,900 0.0	2,692,791	I. 1,207,209	44.8
Mil., L. S. & W..	2,312,503	1,366,674	I. 945,829	38.7
N. Y. Cen. & H. R.	32,605,759	24,495,873	I. 8,109,886	33.1
Net earnings....	12,729,591	7,974,378	I. 4,755,213	59.6
Norfolk & West..	3,232,923	2,750,686	I. 482,247	17.5
Northern Pacific..	12,314.711	11.349,698	I. 965.013	8.5
Peoria, Dec. & E.	800,000	725,000	I. 75,000	10.3
St. L., A. & Tex...	1,816,6.2	1,294,833	I. 521,809	40.2
St. L. & S. F.....	4,860,846	4,432,704	I. 428,142	9.7
Tol. & Ohio Cen..	834 816	....	.....	....
Wab., St. L. & P..	12,806,097	11.936,640	I. 869,457	7.3
Eleven months to Nov. 30:				
Atch., T. & S. F..	$14,459,378	$14.318,022	I. $141,356	1.0
Net earnings....	7,110,190	7,042,938	I. 67,261	0.9
Camden & Atl....	569,494	533,127	I. 36,367	6.9
Net earnings...	138,032	144,412	D. 6,380	4.4
Dan. & Norwalk..	218,724	208,177	I. 10,547	5.1
Grand Rap. & I...	1,891,124	1,795,551	I. 95,573	5.3
Net earnings...	675,058	557,448	I. 117,610	21.1
Louisv. & Nash..	12,714,151	12,512,562	I. 201,589	1.6
Net earnings	4,978,950	4 857.407	I. 121,543	2.5
Mem. & Charles.	1,266,841	1,180,915	I. 85,926	7.3
Net earnings...	412,925	241,987	I. 171,238	70.8
N. Y. & New E....	3,636,812	3,136,914	I. 499,898	15.9
Net earnings...	1,325,993	1,129,728	I. 196,265	17.4
N. Y., Sus. & W...	1,016,895	1,005.950	I. 10,945	1.1
Net earnings...	434.820	468,804	D. 33,984	7.2
Shenandoah Val.	686,359	636.779	I. 49.560	7.8
Net earnings....	77,870	29,344	I. 48,526	165.4
Union Pacific.....	24,260,254	23,371,557	I. 888,697	3.8
Net earnings....	8,160,751	8,765,339	D. 604,088	6.8
West Jersey.....	1,268,889	1,199,147	I. 69,742	5.8
Net earnings...	487,517	462,083	I. 25,434	5.5
Month of October:				
Cairo, V. & C.....	$62,024	$45,327	I. $16,697	37.0
Net earnings...	11,012	4,764	I. 6,248	131.1
Cleve. & Mar.....	24,897	.....	.....	....
Month of November:				
Atch., T. & S. F.	$1,719.355	$1,603,413	I. $115,942	7.2
Net earnings...	985,543	997,534	D. 11,991	1.2
Camden & Atl...	31,809	30,512	I. 1,297	4.2
Net earnings...	*3,072	2,295	D. 5.367	....
Dan. & Norwalk.	18.543	17,313	I. 1,230	7.2
Den. & R. G. W...	101,449	98.563	I. 2,886	3.0
Net earnings....	45,671	35,022	I. 10,649	30 4
Grand Rap. & I...	209.417	191,456	I. 17.961	9.4
Net earnings ...	87,963	81,574	I. 6,389	7.8
Louisv. & Nashv.	1,281.997	1,129.894	I. 152.103	13 4
Net earnings....	530,857	445,668	I. 85,189	19.1
Mem. & Charles..	175.408	150,961	I. 24,447	16 3
Net earnings. ...	75 360	66.390	I. 8,970	13.6
N. Y., & N. E....	347,703	308,210	I. 39,493	12 8
Net earnings....	139,730	122,689	I. 17,041	12.2
N. Y., Sus. & W...	107,735	97,344	I. 10,391	10.7
Net earnings....	52,242	49,690	I. 2.552	5.1
Shenandoah Val..	71,053	57,765	I. 13,288	22.9
Net earnings...	7,341	*42	I. 7,383	....
Union Pacific	2,351,431	2,382,206	D. 30,775	1.3
Net earnings....	834,945	1,005,511	D. 170.566	16.8
West Jersey.....	95,153	85,381	I. 9,772	11.5
Net earnings...	29,075	27,449	I. 1,626	5.9
Month of December:				
Cairo, V. & C.....	$60,165	$48,714	I. $11.451	23 4
Canadian Pacific.	1,728.000	1,438.000	I. 290,000	20.2
Chi. & Alton	713 677	703,925	I. 9,752	1.4
Chicago & Atl....	182,541	129,522	I. 53,019	40.8
Chi. & East. Ill..	170,373	164.063	I. 6,310	3.8
Chi., Mil. & St. P.	2,250,000	2,336.256	D. 86,256	3.7
Den. & R. G	615,6:6	504,175	I. 111,451	22.1
Ev. & T. Haute..	61,5 0	57,040	I. 4,460	8.0
Long Island.....	184,223	179.603	I. 4,620	2.6
Louis. & Nash...	1,275,720	1,164,212	I. 111,508	9.6
L., N. A. & Chic..	155,596	141,792	I. 13,804	9.7
Mexican Central..	436.690	336,681	I. 100 009	29.6
Mil., L. S. & W..	172,275	108,645	I. 63,620	58.4
N. Y. C. & H. R..	2,899,809	2,310,184	I. 589,616	25.6
Norfolk & West..	248,213	228,993	I. 19,220	8.4
Northern Pacific..	879,778	775,370	I. 104.408	13.4
Peoria, Dec. & E.	65.000	53,000	I. 12,000	22.6
St. L., Ark. & T..	230.651	169,495	I. 61,156	36.0
St. Louis & San F.	412,500	376,800	I. 35,700	9.5
Tol. & Ohio Cen..	93,527	67,942	I. 25,585	37 6
Wab , St. L. & P.	1,141,101	1,972,135	I. 68,966	6.4

* Deficit.

Early reports of monthly earnings are usually estimated in part, and are subject to correction by later statements.

Coal.

Coal tonnages for the week ending Dec. 25 are reported a follows:

	1886.	1885.	Inc. or Dec.	P.c.
Anthracite.....	578,743	532,610	I. 46,133	8.7
Eastern bituminous.....	249,344	233,977	I. 15,367	6.6
Coke.....	71,646	76,549	D. 4,903	6.4

The anthracite market is reported active with a great demand for the smaller sizes and more activity in steam coal than there has been for some time.

The market for bituminous coal is active also and deliveries at the seaboard are pressed, many shippers being behind on their contracts.

Pennsylvania Railroad coal tonnage for the week ending Dec. 25 was:

	Coal.	Coke.	Total.	1885.
Line of road.....	153,316	70.016	223,332	214,889
From other lines..	68.915	1,630	70,545	122,598
Total..... ..	222.231	71,646	293,877	337,187
Year to Dec. 11....	11,373,368	3,520,630	14,893,998	14,040,830

Decrease for the week, 43,310 tons, or 12.6 per cent.; increase for the year, 853,168 tons, or 6.1 per cent.

Actual tonnage passing over the Huntingdon & Broad Top road for the year ending Dec. 31 was:

	1886.	1885.	Inc. or Dec.	P.c.
Broad Top coal.....	385,796	176 075	I. 209,721	119.1
Cumberland coal.... ..	266,153	460,289	D. 194,136	42.2
Total.....	651,949	636,364	I. 15,585	2.4

The Broad Top Coal is mined on the line; the Cumberland is carried through from Mt. Dallas to Huntingdon for the Pennsylvania Railroad.

The coal handlers at all the shipping points near New York—Perth Amboy, South Amboy, Elizabethport, Port Johnson, Hoboken, Weehawken, Newburg and Rondout—have struck this week for an increase in wages, and shipments are temporarily stopped.

Trunk Line Executive Committee.

A meeting of the Trunk Line Executive Committee was held at 346 Broadway, New York, Dec. 29.

The subject of maintenance of rates on live stock and dressed meats was under consideration, but no definite action was taken.

Relative Rates on Live Stock and Dressed Meats.

The dressed meat shippers had a hearing before Commissioner Fink on Dec. 28. They claim that the present rates on dressed meats are too high, and that the rates should be based on the cost of transportation solely, without any regard to live stock rates.

Representatives of the live stock interest were also present and protested against any reduction in the present differences between the rates on live stock and dressed meats, which they claimed was very favorable to the dressed meat shippers. No action was taken at the conference.

Pacific Coast Association.

Commissioner Midgley has announced that the Pacific Coast Association will be discontinued on Jan. 1, 1887. This organization was formed for the purpose of dividing Pacific Coast traffic between the roads between Chicago and Mississippi River points and the Missouri River, and was in successful operation until the disruption of the Trans-Continental Association. Since that time it has been continued in the hope that the Trans-Continental Association would be revived; and its disruption at this time is probably in consequence of some of the roads declining to pay any share of the expenses of the association after Jan. 1.

Rates on Dressed Hogs.

Commissioner Fink announces that, taking effect Jan. 10, the rates on dressed hogs will be advanced to the following basis: Chicago to New York, in common cars, carloads, 60 cents; and in refrigerator cars, carloads, or when loaded with dressed beef, 65 cents per 100 lbs.

Brooklyn Bridge Travel.

During the year ending Dec. 31 the number of passengers over the Brooklyn Bridge was 27,436,707, of whom 24,471,307 crossed in the cars, 2,965,400 walked—and 3 jumped off. The receipts from tolls for the year were: Railroad, $673,580; foot passengers, $17,593; vehicles, $64,578: total, $755,690.

Chicago Shipments Eastward.

The Board of Trade reports east-bound shipments from Chicago for the week ending Jan. 1, 1887, as follows, in tons:

	Tons.	P. c.		Tons.	P.c.
Chi. & Gd. Trunk..	11,669	26.3	Pitts., Ft. W. & C...	4,417	10.0
Mich. Central.....	10.875	24.5	Chi., St. L. & Pitts..	4,341	9.8
Lake Shore	6,313	14.3	Balt. & Ohio.....	2,027	4.6
N. Y., Chi. & St. L..	2,183	4.9	C., Ind., St. L. & C..	2,467	5.6

The statement includes local as well as through shipments. The total for the week was 44,292 tons, a decrease of 18,841 tons, or 29.9 per cent. from the preceding week.

Shipments for eight weeks past by these reports have been, in tons:

Week ending							
Nov. 13.	Nov. 20.	Nov. 27.	Dec. 4.	Dec. 11.	Dec. 18.	Dec. 25.	Jan. 1.
37,051	38,409	35,462	40,935	45,238	48,080	63,133	44,292

Shipments by the Chicago & Atlantic road are not included above. These shipments include dead freight only.

RAILROAD LAW.

Injury to Employe—Defective Machinery.

In the case of Framley against the Louisville, New Albany & Chicago Co., the Indiana Supreme Court holds as follows:

1. Where an employé was inexperienced and ignorant in respect to the difference in the construction of deadwoods used in coupling cars, and of the hazard of coupling cars equipped with double deadwoods, and the fact of his knowledge and inexperience was, or by exercise of care might, have been known by the employer, and the employer, nevertheless, without instructing or warning him of the hazard, required him to make such such coupling, and while so engaged the employé was injured, the employer is liable.

2. When a witness has been impeached by showing that he has made statements out of court contradictory to those made at the trial, evidence of his general good character and for truth and veracity is admissible.

3. When the witnesses had described with minuteness the difference in the construction and process of coupling of cars equipped with double or single deadwoods, their opinions were admissible.

4. The fact that one injured by the wrongful or negligent act of another may have been at the time of such injury violating the Sunday law will not prevent a recovery against the wrong-doer.

Principal and Agent.

In Hamilton against the Georgia Railroad & Banking Co., the Georgia Supreme Court holds as follows:

While a principal is responsible for the fraud of his agent acting within the scope of his authority about the business with which he was intrusted, yet the principal is not liable for the fraud of deceit of such agent arising out of transaction beyond the scope of his agency. Therefore, where the Roadmaster of a railroad was authorized to contract for the entire job of building a depot to completion, including the painting of it, and did contract with a contractor for the entire work, the company would be bound thereby; but where the Roadmaster made representations to a sub-contractor, who painted the building, to the effect that the sub-contractor need not record his lien; that the company owed the contractor largely more than the latter owed the sub-contractor; that it was the intention of the Roadmaster not to settle with the contractor until all debts for work done on the building were brought in and included in the settlement; that the company had other work for the contractor to do; and that the sub-contractor was certain of his money, thereby causing the sub-contractor to fail to record his lien; and where the Roadmaster immediately thereafter settled with the main contractor and paid him in full, the company was not liable in an action of deceit, and on a suit therefor against the company, a non-suit was properly awarded.

Ownership of Lands by Foreign Company in Pennsylvania.

In Philadelphia, Jan. 3, in deciding an appeal from the decision of the Jefferson County Court, in the suit brought by the Commonwealth against the New York, Lake Erie & Western Railroad Co., the Supreme Court delivered an opinion. The suit was a proceeding to escheat coal lands in Jefferson County, alleged to be owned by the railroad company, which is a New York corporation, in violation of the act of April 26, 1855. That act declares that "no corporation other than such as shall have been incorporated under the laws of this state shall hereafter acquire and hold any real estate within this commonwealth directly in the incorporate name or through any trustee or other device whatsoever, unless specially authorized to hold such property by the laws of this commonwealth."

The commonwealth alleged that the railroad company practically acquired the lands in 1873 by purchasing them in the name of one Early, who was merely a trustee or agent for the company. Subsequently the railroad company purchased a charter of the Northwestern Mining & Exchange Co. Early conveyed the lands which he had purchased to this company, and the railroad company took all of its capital stock except 10 shares, which were allotted to the gentlemen who were to act as directors. Early's testimony on the trial of the case supported these allegations.

The Erie Co. admitted, in its pleadings, the ownership of a majority of the stock of the Exchange Co., but denied any kind of ownership of the lands, and also denied any trusteeship in its favor in Early's original purchase. No testimony was offered for the defense upon the trial. The judge refused the points for charge submitted by the Commonwealth, and directed a verdict for the defendant, saying:

"If the company had used the name of another as trustee, or by any device had used even a corporation as trustee, and the jury so found, the lands would be liable to escheat, but under the facts in this case we answer the points in the negative. They have used a Pennsylvania charter, and although they virtually paid for all the stock, we do not think that the lands are subject to escheat. In other words, we think if there is anything vicious in the organization the plaintiff ought to have proceeded to forfeit the charter or dissolve it."

The Supreme Court overrules the decision and orders a new trial, saying, among other things: "If the company has in fact acquired and holds real estate in this commonwealth it is incumbent on the company to show that it has been specially authorized by law to hold such property. In the absence of such proof the acquisition and holding is illegal, and the ninth section of the act, providing the remedy of escheat, comes into play."

The Pennsylvania Pool Suits.

Another session was held last week in the Court of Common Pleas, at Philadelphia, and the time was pretty much all consumed in examining Mr. J. S. Harris, President of the Lehigh Coal & Navigation Co.

Mr. Harris stated that since 1884 he had attended several meetings of people interested in coal lands. At these meetings the subject of a division of the anthracite coal trade among all interests and for monthly or yearly quotas was discussed and a plan of apportionments to different companies was made for 15 months ending March 31, 1886. This agreement was never carried out. Later, a committee was appointed to confer with the Pennsylvania Railroad Co. and the coal interests which it controlled relative to the anthracite coal trade. On March 22, 1886, another meeting was held in New York, at which all the different interests were represented. It was agreed to advance the price of coal 25 cents per ton. At another meeting it was decided that the tonnage for 1886 be based upon that for 1885. The Pennsylvania Railroad Co. and the New York, Lake Erie & Western Railroad Co. refused to abide by the agreement.

OLD AND NEW ROADS.

Annapolis & Baltimore Short Line.—This company has executed a mortgage of its roadbed and franchises for a consideration of $500,000, to the Baltimore Safety Deposit & Trust Co. The object of the loan is to pay its secured mortgage bonds owned by the mortgagee.

Atchison, Topeka & Santa Fe.—Mr. Clarence H. Venner has filed a bill in the Supreme Court of Massachusetts, asking for an injunction to restrain the directors and officers of the Atchison Co. from guaranteeing the bonds of the California Southern Railroad Company, amounting to $2,000,000. The Court has issued an order for the defendants to show why this injunction should not be granted.

Baltimore & Ohio.—This road has received a setback to its Staten Island terminus by a Supreme Court decision setting aside its lease from the city of its terminal pier in New York. In the summer of 1884, John H. Starin began a suit against the Staten Island Rapid Transit Railroad Co. to have their lease of the wharf at the foot of Whitehall street set aside, on the ground that the awardment of the franchise to this company for operating ferries from there to Bay Ridge was illegal. Judge Daniels decides that the two franchises will have to be resold.

Boston & Lowell.—At the annual meeting, Jan. 5, the stockholders voted to authorize the issue of $500,000 new bonds to pay for terminal property and other improvements.

It is reported that negotiations have been resumed for the lease by this company of the Connecticut & Passumpsic Rivers road.

Canadian Pacific.—This road has been notified by the imperial government that twelve 80-ton guns for the defense of Victoria, British Columbia, will be ready for transportation in April next. Special cars for this conveyance are now being built by the company.

Central, of Georgia.—At the annual election in Savannah, Jan. 3, the old management was defeated and the opposition ticket, with General E. B. Alexander at its head, was elected by a vote of 43,000. A very large vote was cast, nearly the whole of the 75,000 shares being voted on. The board elected with General Alexander is almost entirely new.

Many rumors are current as to the action of the company and its policy under the new management. General Alexander announces that the road is to be entirely independent and is to be operated in the interest of the owners and of the country along the line, and to build up the largest possible local traffic. The general impression, however, is that the new management, if not controlled with the parties who now own the Richmond & Danville road, will at any rate be very friendly to that interest, and that the Central lines will be operated in harmony with the Richmond & Danville lines rather than with the Louisville & Nashville.

Central, of New Jersey.—The Receivers issued the following circular on Dec. 30: "The Central Railroad Co., of New Jersey, having exercised its option of terminating the lease of the Philadelphia & Reading Railroad Co., the undersigned, who have been duly appointed Receivers of the Central Railroad, of New Jersey, under decrees of the United States Circuit Court in the districts of New Jersey, Eastern Pennsylvania and Southern New York, will, in pursuance of such decrees, take possession and assume the operation of its railroads and other property on Jan. 1, 1887. All present officers, agents and employés of the Reading Receivers on the former New Jersey Central, New Jersey Southern and Lehigh & Susquehanna divisions of the Philadelphia & Reading Railroad will be continued in their respective positions from Jan. 1, 1887, at their present rate of compensation, unless otherwise notified. The Receivers rely on the hearty co-operation of all employés in their endeavor to operate the road to the best interests of the public and all concerned."

Chicago, Kansas & Nebraska.—The charter has been filed for record in Nebraska. This is the company that was previously organized in Kansas to build the Chicago, ck Island & Pacific extension in those states. The esti-

mated length of the new road is 1,150 miles, and the capital stock is put at $15,000,000. The main line is to run from a point on the Missouri River opposite St. Joseph in a southerly direction to the Indian Territory. A branch is to run from a point on the first line near Lost Springs to the town of Hunnewell.

Other branches are as follows: From a point in Doniphan County, Kan., northwest to the Nebraska line, then through Pawnee, Gage, Jefferson, Thayer and Nickolls counties, in Nebraska; and Republic, Jewel, Smith, Phillips, Norton, Decatur, Rawlins and Cheyenne counties, in Kansas. Another is from Atchison to Topeka, another from Atchison to Holton, Kansas.

The road is now nearly completed from St. Joseph, Mo., to the Nebraska line, and from St. Joseph to Topeka.

Chicago, Madison & Northern.—Grading on this road is reported nearly finished from Freeport, Ill., northward to Madison, Wis. Tracklaying is in progress and the rails are down for 11 miles from Freeport.

Chicago, Milwaukee & St. Paul.—The road from Merrill, Wis., to the Tomahawk River, has been practically located, and surveys are now being made. The company intends to build up several lumber manufacturing points between Morrill and the state line north. Seven mill sites have been spoken for already.

A corrected statement of the track laid on this company's new branches and extensions during the year 1886 is as follows:

	Miles.	
In Minnesota:		
Branch, Hastings & Dak. Div., Glencoe northwest to Hutchinson	13.4	
In Iowa:		
Sioux City Ex., Manilla (Council Bluffs Div.) northwest to Charter Oak	26.0	
Sioux City Ex., Sioux City southeast to Rodney	37.0	
Kansas City Line, Ottumwa to Moravia	25.0	
		88.0
In Missouri:		
Kansas City Ex., Gault to Gorham	11.0	
In Dakota:		
Andover north to Harlem	55.6	
Ellendale north to Edgely	26.0	
Ipswich west to Bowdle	30 4	
Roscoe north to Hillsview	26.5	
Roscoe south to Ree Valley	38.3	
Bristol south to Elrod	34.4	
Madison north to Preston	30.4	
Scotland northwest to Mitchell	47.8	
Tripp west to Armour	20.3	
		309.7
Total new track for the year		422.1

At the close of 1885 the company reported 4,921 miles of road. The additions made last year therefore bring the mileage owned and worked up to 5,343 miles at the close of 1886.

Chicago & Northwestern.—Permission has been refused to build a branch road through the Fort Meade military reservation in Dakota.

Chicago, Santa Fe & California.—This company, which is to build part of the Atchison, Topeka & Santa Fe's extension to Chicago, has selected Fort Madison, Ia., as the point for crossing the Mississippi. Work has already been begun there.

Chicago & Southwestern.—Articles of incorporation have been filed at Springfield, Ill., for the construction of a road from Chicago to a point on the Indiana State line, and to a point in the township of Thornton, Cook County, Ill. Principal office, Chicago. Capital stock, $100,000.

Cincinnati, Hamilton & Dayton.—At the special meeting, Jan. 5, the stockholders voted to authorize the issue of $500,000 new stock and $500,000 new 4½ per cent. bonds to pay for improvements and extensions.

Connecticut & Passumpsic Rivers.—The report of a lease of this road to the Boston & Lowell Co. is revived, and it is said that terms have been substantially agreed on.

Delaware & Hudson Canal Co.—This company reduced fares Jan. 1 on the Saratoga and Champlain divisions from four to three cents a mile.

Denver & Rio Grande.—An approximate statement for the year ending Dec. 31 is as follows:

Gross earnings	$6,764,995
Expenses	4,258,015
Net earnings	$2,506,980

The total interest charges of the company as reorganized amount to $1,350,000 yearly, showing a considerable surplus. The first coupon on the new bonds fell due Jan. 1, and was paid.

Dubuque & Sioux City.—A committee of the directors on Dec. 13, 1886, appointed Drexel, Morgan & Co. trustees to receive stock that might be deposited with them for the purpose of enabling the directors to sell the property or to sell the stock at a price not less than par, or to execute a new lease on a basis that should not yield less than 4 per cent. on the stock, and to vote for such directors as they might select. In case these purposes could not be carried out, any modifications which might be assented to by three-fourths of the amount deposited should be binding upon all. It is understood that some of the depositors have been anxious to recover their stock for fear the Illinois Central might not be willing to renew the lease on the proposed terms, but would build an independent line, which would greatly injure the Dubuque & Sioux City road. One of the depositors has secured from Seward, Da Costa & Guthrie, of New York, an opinion to the effect that any depositor of stock with Drexel, Morgan & Co. under the appointment of Dec. 13 can revoke his action, by legal proceedings if necessary; that in the meantime any transfer or use of the certificates can be enjoined; that the deposit of certificates with Drexel, Morgan & Co. confers upon them no power of voting, that it is a fact tantamount to a power to the directors to vote themselves a perpetuity in office, and that in general the power of attorney or proxy, its signature, and the deposit of certificates are revocable by any holder.

Eastern.—The apportionment of the preferred stock and scrip is being made and will be issued shortly.

Fitchburg.—Boston dispatches state that terms have been agreed on for the transfer of the Troy & Greenfield road, including the Hoosac Tunnel, to this company. The terms include the formation of a consolidated corporation to own the line from Boston to the Hudson River. The State of Massachusetts is to receive $5,000,000 bonds and a considerable amount of the stock of the consolidated company, and is to have a representation in its board of directors. The present stock of the Fitchburg Co. is to be preferred stock. Some details remain to be arranged, although the contract is said to be practically closed.

Fort Worth & Denver.—This company, on Jan. 15, will set the force at work all along the line of its extension to the Canadian River through the Texas Panhandle.

Fort Worth & Rio Grande.—Grading is now in progress from Granbury, Texas, to Fort Worth, and 95 men are at work on the bridge over the Brazos. The engineers have run three lines into Fort Worth, two of them to a connection with the Texas & Pacific. Everything is in readiness, and work on the road is to be swiftly pushed to completion.

Fort Worth Western.—Grading is to begin before the end of January, and will be pushed right through. The work will begin at Fort Worth Tex.

Georgia Midland & Gulf.—Track is now laid 30 miles from Columbus, Ga., and progressing rapidly. Two iron bridges, built by the Phenix Bridge Co., have arrived, and are being placed in position over Mulberry Creek. The tunnel at Pine Mountains is through and will be finished by the middle of January. Regular trains are running between Columbus and Waverley Hall, Ga., 25 miles.

Gulf, Colorado & Santa Fe.—Track is now laid to the Red River, 72 miles north of Fort Worth, Tex. The temporary bridge over the river is finished and tracklaying is to be pushed northward.

On the extension of the Dallas Branch track is laid to Honey Grove, Tex., 79 miles northeast from Dallas, and regular trains will run to the new terminus in a few days.

Hoosac Tunnel & Northern.—A year ago certain Holyoke parties built a 10 mile road from the Hoosac Tunnel into the Vermont forests to bring out wood for paper making. Their proceedings being illegal, papers were filed by the owners on Dec. 28, with the Massachusetts Railroad Commissioners and the road, to be called henceforth the Hoosac Tunnel & Northern, will be carried about ten miles further into the forests. It has heretofore been known as the Deerfield Valley road.

Houston & Texas Central.—It has been reported that Mr. C. P. Huntington has made a change in the proposition to the bondholders by which the overdue coupons on the first-mortgage main line bonds and the coupons due on Jan. 1 are to be paid in cash, the mortgage to remain as it stands and to be paid off at maturity. Under the plan the the second-mortgage bonds are to have the interest reduced to 5 per cent., and the general mortgage bonds 4 per cent., and debenture bonds are to be issued for the overdue coupons. These bonds and the interest on all the bonds are to be guaranteed by the Southern Pacific Railway. This report is not fully confirmed, but is said that any announcement is yet premature.

The Farmers' Loan & Trust Co., by Turner, Lee & McClure, its attorneys, has begun an action to restrain the sale of 880 of the general mortgage bonds of the Houston & Texas Central Railway Co. These bonds are held by, or are under the control of Morgan's Louisiana & Texas Railroad & Steamship Co., which claims that they have been pledged with them to secure indebtedness of the railway company. The Farmers' Loan and Trust Co. is the trustee of the general mortgage, under which over 4,000 bonds have been issued, and it claims that these 880 bonds in question could never have been properly issued, inasmuch as the mortgage does not authorize their being issued in order to be used as collateral, but only authorizes their sale in order to pay off and discharge the indebtedness of the railroad, or for the improvement and equipment of the railroad.

Illinois Central.—Arrangements have been completed for building a bridge at Aberdeen, Miss., across the Tombigbee River, for the extension of the Canton, Aberdeen & Nashville Branch, to a connection with the Kansas City, Memphis & Birmingham, which passes through Monroe County, Miss., about twelve miles north of Aberdeen. The Kansas City company also has a party in the field, surveying one branch for connection with Aberdeen.

This company has assumed control of the Havana, Rantoul & Eastern, a road which was sold under foreclosure in October last. It extends from Lebanon, Ind., to Leroy, Ill., a distance of 76 miles. The officials of the road will be retained as division officers of the Central.

Indianapolis, Peru & Chicago.—Receivers Humphreys and Tutt will continue to operate this line in connection with the Eel River Division of the Wabash. This division is the only one that has not passed under the control of the new Receiver, Judge Cooley.

Kansas City, Wyandotte & Northwestern.—The track of this road is now laid (including side track) to White Church, 10 miles from the point of beginning at the mouth of the Kansas River, between Kansas City and Wyandotte.

Kansas & Gulf Short Line.—It is currently rumored that this road will soon belong to the Missouri Pacific system, and be made a standard gauge road.

Lake Erie & Western.—Notice is published that the purchaser, General Samuel Thomas, has agreed to sell the property to a new company to be formed, called the Lake Erie & Western Railroad Co., whose line will extend from Sandusky, Ohio, to Peoria, Ill., 430 miles, and which will issue the following securities: $4,300,000 first mortgage 5 per cent. 50-year bonds, being at the rate of $10,000 per mile; $8,600,000 preferred stock, being at the rate of $20,000 per mile; $8,600,000 common stock, being at the rate of $20,000 per mile. All old securities have been extinguished by the sale, and will receive their respective portions of the purchase money from the officers of the court. The present car trusts will also be paid off, leaving the property free from lien except as above.

Little Rock & Fort Smith.—It is stated that Mr. E. Atkins, of Boston, has sold out his entire holdings in this line, of which he was formerly president, to Jay Gould. This gives Mr. Gould complete control of the property. The Little Rock & Fort Smith and the Little Rock, Missouri River & Texas will shortly become a part of the Missouri Pacific system.

Little Rock, Mississippi River & Texas.—Judge Caldwell, of the United States District Court, has granted the petition of Mr. Jay Gould to annul the sale of this road, purchased by Mr. Gould on Dec. 15. In view of the fact that Mr. Gould had overlooked the Arkansas statute which gives a debtor 12 months in which to redeem property sold under a mortgage, the law making it only obligatory that the amount of purchase money with 15 per cent. interest added shall be paid in order to get possession of such property, and also upon its being made known to the Court that Mr. Gould still desired to buy the road with statutory protection, the prayer was granted.

The Court orders that $25,000 belonging to Mr. Gould be held as security that the bid for the property will be made. It is understood that the bid will be $1,500,000.

Louisville & Nashville.—The statement for November and the five months of the fiscal year from July 1 to Nov. 30 is as follows:

	November.		Five months.	
	1886.	1885.	1886.	1885.
Earnings	$1,281,997	$1,129,894	$6,384,283	$5,677,705
Expenses	751,139	684,226	3,693,654	3,460,966
Net earnings	$530,858	$445,668	$2,690,629	$2,216,739

For the five months the gross earnings increased $706,578, or 11.9 per cent., and the expenses $232,688, or 6.3 per cent., the result being a gain of $473,890, or 21.4 per cent., in net earnings.

Manitoba Railway Construction Co.—A charter has been granted for the purpose of constructing and operating a line of railway from Winnipeg to Emerson. The object is to secure the Local Government aid of $6,400 per mile.

Memphis & Nashville.—Articles of incorporation have been filed in Tennessee by this company. The proposed line of road will be built from Memphis to Nashville. It is to be in conjunction with another new road, known as the Tennessee Midland, the two being a consolidation of the interests of T. C. Leake, Jr., with those of A. L. Crawford and associates, the previous incorporators of the Nashville & Knoxville Railroad. The scheme proposes a line of road diagonally across the state, from southwest to northeast, and two engineering parties are already in the field, working west and east of Jackson.

Missisquoi Valley.—An official notice proclaims that a corporation of this name has been formed, and articles of association have been filed at St. Albans, Vt. The association is composed of a majority of the mortgage bondholders of the Missisquoi Railroad, which has passed to the bondholders under a strict foreclosure. The road exteuds from St. Albans, Vt., to Richford, 28 miles.

Missouri Pacific.—The survey of the extension between Booneville and Lexington, Mo., has been completed from the Lamine River to Marshall, Mo. The route passes through the southern boundary of Marshall. It is reported that work has been commenced between Booneville and the Lamine River; also between Marshall and Lexington. The road will be completed by July 1.

Col. R. B. Van Frank, in charge of 16 men, has begun work at Houston, Tex., on the Taylor, Bastrop & Houston Branch of this road. The party will meet the east-bound engineering corps heading for Houston from Bastrop, in the vicinity of La Grange.

This company will proceed at once to construct the extensions on its Texas system from Dallas to Waco, Bastrop to Houston, and Dangerfield to Texarkana.

Minnesota & Northwestern.—President Stickney and General Superintendent Dupuy, returning to St. Paul from an inspection trip over their road, report that the grading on the new Freeport & Chicago line is finished, and 42 miles of track have been laid. Fifty-two miles are yet to be laid to reach Freeport. This is expected to be done early in January, and then work will be commenced on the line between Freeport and Dubuque. When completed the mileage between St. Paul and Chicago will be reduced from 484 to 420 miles. On the completion of the Chicago, Kansas City & St. Paul line from Waterloo to Des Moines the distance from St. Paul to Kansas City will be reduced from 563 to 515 miles.

Nashville & Chattanooga.—Arrangements have been consummated for the completion of the Nashville & Florence Branch to Florence, Ala., also a branch to the West Point ore beds in Lawrence County.

Nebraska, Kansas & Cimarron River.—This company has been incorporated at Topeka, Kansas, and proposes to construct a line through the counties of Decatur, Rawlins, Thomas, St. John, Wichita and Hamilton, in Kansas, striking the town of Kendall, in Hamilton County, and passing through the county of Morton to the coal mines on the Cimarron River. Capital stock, $3,000,000.

Nebraska, Kansas & Texas.—This newly incorporated company proposes to construct a line through the following Kansas counties: Decatur, Sheridan, Gove, Lane, Hodgeman, Ford, Clark, Mead and Seward, thence south across the Panhandle to Wormwood Springs, in Texas; principal place of business, Oberlin, Kan.; capital stock, $2,000,000; estimated length of road, 590 miles.

New York Central & Hudson River.—The statement (partly estimated) for the quarter ending Dec. 31 is as follows:

	1886.	1885.	Increase.	P. c.
Earnings	$8,876,000	$6,876,602	$2,099,398	30.5
Expenses	5,401,000	4,135,209	1,265,791	30.6
Net earnings	$3,575,000	$2,741,393	$833,607	30.4
First charges	1,957,200	1,467,000	490,200	33 4
Profit	$1,617,800	$1,274,393	$343,407	27.0
Dividend	894,283	894,283		
Surplus	$723.517	$380.110	$343.407	90.3
Per cent. of exps.	60.17	60.13	0.04	
Profit per share	$1.81	$1.43	$0.38	27.0
Dividend "	1.00	1.00		

The statement includes the West Shore road in 1886, but not in 1885.

New York, Chicago & St. Louis.—On Jan 3 the Common Pleas Court for Cuyahoga County, Ohio, decided in the suit of the Union Trust Co. against this company. Several defendants challenged the legality of the company's organization because of non-conformity with Ohio laws concerning consolidation. The Court finds that the consolidation was not in accordance with the statute; that the transfer by directors of $15,000,000 of stock as paid up and the same amount of bonds secured by mortgage to the Central Trust Co., was in effect a fraudulent sale. It was made by persons assuming to act as directors, but really acting in their own interests as servants and members of the syndicate, without a dollar of stock having in good faith been subscribed or paid in, and "the whole scheme was unlawful and in defiance of the public policy of Ohio in regard to railroad corporations. The alleged mortgage is null and void."

The Judge also says:

"We further hold that the ten-million-dollar (second) mortgage held in trust by the Union Trust Co. is valid. We also find that plaintiff is entitled to a decree for a foreclosure and sale of said railroad property. We also find that no part of the equipment was covered by the mortgage, but the title of it was in Shethar and McGourkey, Trustees; the said trustees have a valid lien, and the decree may provide for the separate sale of the equipment. A decree may also be entered ordering the appraisement, advertisement, and sale of the New York, Chicago & St. Louis road, with all its property and appurtenances included in said mortgage, extending from Buffalo to Chicago, and at those points, by one or more special master Commissioners, to be hereafter appointed.

"We find further that neither the Lake Shore Railroad Co. nor any of the judgment creditors have any lien by virtue of their judgments nor any interest therein except as creditors to the extent of their judgments against said road."

Mr. Chauncey M. Depew briskly expresses the situation as follows:

"There is only one way that a child can be borne into this world, and only one way that corporations can be created. The Nickel Plate was a paper road when that first mortgage was executed, and had no legitimate existence, but before the mortgage of 1883 was made the scheme had materialized, hence the decision. All I care to say now about the effect of the decision on the Lake Shore Railroad is that it is favorable. As to what will be done in the future or how the stock of the Lake Shore will be affected that is too indefinite to talk about."

Council for the bondholders say that the case will be carried into the Ohio Supreme Court. A long litigation is anticipated, as it is unlikely that a settlement can be agreed upon. The bondholders demand par and interest.

New York & New England.—The statement for November and the two months of the fiscal year from Oct. 1 to Nov. 30 is as follows:

	November.		Two months	
	1886.	1885	1886.	1885.
Earnings	$347,703	$308,210	$728,883	$648,173
Expenses	207,973	185.520	430,644	374,779
Net earnings	$139,730	$122,690	$298,239	$273,394

For the two months the gross earnings increased $80,710, or 12.4 per cent., and the expenses $55,865, or 14.9 per cent., leaving a gain of $24,845, or 9.1 per cent., in the net earnings.

Northern Pacific.—Civil Engineer H. S. Huson, in charge of construction of the Cascade Division in Washington Territory, reports that the grading west from Ellensburg to the summit of the Cascades has been completed; that is, the east half of the switchback is finished, with the exception of 8½ miles, the steel rails for this section not yet having arrived. The railroad bridges are all ready for the stringers and ties up to the summit. The west side is now completed to Sunday Creek, 65 miles east of Tacoma, upon which the track is all laid; the road is graded 5 miles further. From this point to the 75 mile post it will take 30 days to complete. Over the mountain grade every cut is opened and the work is being pushed in all parts. In case of a continuance of good weather the track may be joined by the first of March. But the snow will probably deter this event till the first of May.

Several slight improvements are being made in the Yellowstone Division of this road. A new water tank with a capacity of 53,000 gallons has been constructed; the storage capacity for ice has been enlarged by an extensive addition to the old ice house; the company's station at Miles City is now lighted by electric lamps. At Forsythe a new 56 ft. iron turn table will soon replace the wooden one heretofore used.

Oregonian.—To the petition of Mr. C. N. Scott, Receiver of this company, whether he should accept the proposition of the Oregon & California to connect with it at Woodburn on the east side and at White's Crossing on the west side, or the proposition of the Portland & Willamette Valley road to connect with it at Dundee and Ray's Landing, the United States Circuit Court at Portland authorized Mr. Scott to accept the terms offered by the latter road. The Portland & Willamette Valley is really an extension of the lines of the Oregonian Railway Co., forming the stem of a Y, of which they are the branches. The entire system is under the direction of Mr. Scott, and he intends to have trains running regularly from Jan. 1.

Philadelphia & Reading.—The following circular was issued by the Receivers under date of Dec. 30:

"Notice is hereby given that the services of all persons employed by the Receivers of the Philadelphia & Reading Railroad Company upon and in connection with the lines of railroads embraced in the system of the Central Railroad Co. of New Jersey will be dispensed with by the said Receivers on and after Jan. 1, 1887, pursuant to notice received by said Receivers of the purpose of the said Central Railroad Co. of New Jersey, and its Receivers to resume possession at that time of said lines of railroad, under the terms of the order of the Circuit Court of the United States for the Eastern District of Pennsylvania, at which time the receivers of the Philadelphia & Reading Railroad Co. will yield up possession of said lines."

The Reconstruction Trustees of this road have published a request as follows:

"Creditors and shareholders will deposit general mortgage bonds with Messrs. Drexel & Co., and other securities with Messrs. Brown Brothers & Co., under the terms of the agreement of March 22, 1886, as modified by the plan of reorganization of Dec. 14, 1886,

"The cash subscription will be called for in installments of 25 per cent. each, and thirty-five days' notice will be given by advertisement prior to each call.

"Creditors and shareholders are given until March 1, 1887, to accept the provisions of this plan.

"In case a reorganization without foreclosure cannot be effected, then all parties who have failed to deposit under the plan by March 1, 1887, will be excluded from all participation in the reorganization by foreclosure, which (if there be sufficient deposits to satisfy the Trustees), will then be brought about immediately, and for the benefit of those only who have deposited."

St. Louis, Atkinson & Texas.—A branch is to be built from Fisher's, on this line, to Newport on the Iron Mountain road, thus forming an important link between the two roads.

St. Louis & Southeastern.—Articles of incorporation have been filed by this company at Chester, Ill. It is intended to construct the road through the counties of St. Clair, Randolph, Perry, Jackson, Union and Alexander, to Cairo. The capital stock is fixed at $1,000,000, to be divided into 10,000 shares of $100 each.

St. Paul, Minneapolis & Manitoba.—The road between Rutland and Aberdeen, D. T., has been completed, and regular trains are now running between St. Paul, Minn., and Aberdeen. Distance from Rutland to Aberdeen, 87.65 miles. The branch line of this company between Hutchinson Junction and Hutchinson, Minn., is completed, and regular trains are now running. The distance is 53.06 miles.

Santa Rosa & Benicia Central.—The terms of the contract say that work must begin on the road within 60 days. From 500 to 1,000 men will be employed on the construction. The engineers are now making the final survey. The new road will run from Santa Rosa, Cal., to Benicia, and will be nearly parallel to a present branch of the San Francisco and North Pacific.

Sheffield & Seaboard.—A new road of this name is to be built from Sheffield, Ala., in a southwesterly direction to the Kansas City, Memphis & Birmingham road, now in process of construction.

Shenandoah Valley.—In regard to the item published last week, it turns out that the report of the Master has not yet been filed in this case, and the whole matter has been postponed until March next, when it will be decided at a Special Term of the Court to be held for that purpose. In the meantime further testimony will be taken, and any report of the probable findings of the Master is unquestionably premature while the case is yet unfinished.

South Pacific Coast.—Senator J. G. Fair denies that this road has been sold to the Southern Pacific Co. That company has made no offer as yet.

South Pennsylvania.—At the recent meeting in this city Mr. Franklin B. Gowen offered a bond of seventy-five cents on the dollar for such money as has been put into this company by the Vanderbilts and their friends. The proposition was favorably received. Dr. Hostetter is of the opinion that all the Vanderbilts and those connected with them will sign an agreement embodying these ideas. He expects Mr. Bagaley, Mr. Carnegie, Dr. Colgate and the Standard Oil Company to join him in the purchase of $5,000,000 of the stock, which is two-thirds of the whole. There will be some slight change in the name of the company, and it is probable that a foreclosure and sale will be made so as to free it from all its present embarrassment and legal tangles.

Storm.—The worst storm in five years was reported early this week in Michigan, the snow being 5 ft. deep on a level. Three west-bound trains became stalled five miles east of Michigan City, and it took four locomotives nearly all day to draw them into town. The Grand Rapids train crashed into the rear of the New York fast express, which had been caught near New Buffalo. A Wagner sleeper was damaged, and the fireman and the porter sustained injuries. Similar trouble was experienced on the Wabash road, three engines being required to take out the regular day train. No freights were run on either line.

Tennessee Midland.—Articles of incorporation have been filed by this company. The proposed line of road will run from Memphis to a point on the Virginia state line at or near its crossing of Clinch River, in Hancock County. The new road will be operated in conjunction with the Memphis & Nashville, the incorporators of which are identical.

Terre Haute & Indianapolis.—The South Branch extension, from Brazil City, Ind., is nearly completed. The extension will connect with the Chicago & Indiana Coal road at Brazil, and with the Evansville & Indianapolis at Saline City. A hundred and fifty miles of this road runs through coal fields, which it will have the effect of opening up.

Texas & Pacific.—Work has been begun on a short branch, which will leave the main line at Strawn, Tex., 81 miles west of Forth Worth, and run to some newly discovered coal mines, about three miles distant.

Troy & Boston.—It is stated that the majority of this company's stock has been sold to the Fitchburg Railroad Co. That company also offers to take all the stock which may be offered.

Troy & Greenfield.—Terms have been agreed upon for the transfer of this road to the Fitchburg Co., as noted elsewhere.

Union Pacific.—In the recent report made by the government directors of this road to the Secretary of the Interior at Washington, it is stated that the following extensions of the branch line system are now in process of construction: Omaha & Elkhorn Valley, from North Bend to Stanton, 48 miles; Omaha, Niobrara & Black Hills, from Albion to Wheeler, 6 miles; Omaha & Republican Valley, from Howard to Pilot, 40 miles, and Kearney to Millvale, 72 miles, making in all, for the two sections, 112; Salina, Lincoln & Western, from Centre to Paradise, 16 miles; Oakley & Colby, 22 miles; Greeley, Salt Lake & Pacific, from Loveland to Buckhorn Quarry, 8 miles; Dillon to Grand River, Col., 41 miles; Grand River Valley, 86 miles; Union Pacific & Western Colorado of Wyoming, 25 miles, making for those three branches a total of 152 miles; Cheyenne & Northern, 122 miles; Utah & Northern, from Anaconda mines to Walkerville, 3 miles. All these branches run up a total of 484 miles.

The statement for November and the eleven months to Nov. 30 is as follows:

	November.		Eleven months.	
	1886.	1885.	1886.	1885.
Earnings	$2,351,431	$2,382,206	$24,260,254	$23,371,557
Expenses	1,516,486	1,376,695	16,098,503	14,605,718
Net earnings	$834,945	$1,005,511	$8,161,751	$8,765,839

Expenses include taxes. For the eleven months the gross earnings increased $888,697, or 3.8 per cent., but there was a decrease of $604,088, or 6.9 per cent., in net earnings.

Versailles & Midway.—This road will be extended from Versailles, Ky., to Lawrenceburg, about 14 miles. The road is now in operation from Versailles north to Midway, 10 miles.

Wabash, St. Louis & Pacific.—Before making his decision in regard to the prayer of the purchasing committee's attorneys to turn over this property, Judge Brewer expressed the following incisive opinions: "As appears from certified copies presented to us, the Circuit Court of the Seventh Judicial Circuit, disregarding the comity that has heretofore existed between federal courts, has removed the receivers appointed by this court, and has appointed a distinguished citizen of Michigan as their successor for the lines within the jurisdiction of this court. I say in disregard of the comity which has existed between courts of different circuits, for the pretext of enforcing local liens is too transparent to deceive any one. That court is of equal jurisdiction with this, and we disclaim any intent of criticising its action. The practical question now is, what is to be done? It is the duty of this court to see that the property left in the hands of the receivers appointed by this court is fully protected. The power of foreclosing the general mortgage and of apportioning the receivers' certificates remains with this court, and it is fitting that such apportionment should be proceeded with at once. In the decree for sale there is no attempt at foreclosing the underlying mortgages, and the purchasers took the property subject to these obligations, but did not assume them. The sale has been made and the deed for the property given as provided by the decree. The possession is still in the receivers, and is to be held by them until these obligations are paid or security for their payment is given. We are aware that in the management of so vast a property some time must be taken in the arrangement of detail, but the time is now come when the court shall demand the payment of these obligations or the giving of the security." The judge then read an order requiring the receivers to relinquish all roads east of the Mississippi river to Receiver Cooley. "We understand that there are lines east of the Mississippi river not within the terms of that order—roads that begin nowhere and end nowhere. It also appears that every one of such roads except one has been operated at a loss. So the order will be that they will cease to operate all lines east of the Mississippi river whose earnings shall be less than expenses, unless they are given within thirty days a guaranty against loss in the operation of such lines. There will be no dismissal of the case pending in this court as to any parties or interests or causes of action, or any relinquishment of any jurisdiction which is now vested in this court. It appears that there are now due or will become due by the close of February about $750,000 of the receivers' certificates. Therefore, the purchasing committee should be directed to pay within sixty days into the registry of this court $1,000,000 in cash for receivers' certificates, and to give bond in the sum of $1,000,000 to pay the further awards and to comply with all further orders of this court, and to then take possession of the entire property, subject to the right of this court to retake possession on non-compliance with further orders."

Judge Brewer ordered that all the books of account of the roads under the new receiver be turned over to Judge Cooley, but that the present receivers retain in their possession all the general books, but give Judge Cooley all facilities for examining them. He also ordered that they retain all money now on hand, surrender all rolling stock covered by mortgages and report to this court any disputes which may grow out of such delivery.

The rolling stock which Judge Brewer has ordered to be turned over to Judge Cooley will not, it is said, be sufficient to operate the roads he will have control of, as most of that covered by mortgages has long ago been worn out or so diverted that it cannot now be recovered. The operating of the following lines east of the Mississippi will be abandoned under this order unless the receivers are guaranteed against loss:

The Eel River, Detroit, Butler and St. Louis, Attica, Covington and Southern, Springfield, Northwestern, Peoria, Pekin and Jacksonville, Pike county, Champaign and Southeastern and the Madison county.

Receivers Humphreys and Tutt desire to pay at once all the debts of the Chicago division, and to take the property off Judge Cooley's hands. Provided this division can obtain a connection with East St. Louis, this plan will furnish the Wabash lines with an eastern outlet independent of the lines under Judge Cooley's charge.

A St. Louis dispatch of Jan. 4 says: "Judge Cooley, the Receiver of the Wabash lines east of the Mississippi River, and his legal adviser, Henry Crawford, arrived here from Chicago to-day, and were in conference this morning with Receivers Humphreys and Tutt, James F. How, their Agent, and Wells H. Blodgett, their Attorney. A general discussion of the Wabash property and affairs was engaged in, and it was decided that the two lines shall operate in harmony, and that the system shall remain complete, so far as its traffic is concerned."

West Jersey.—The statement for November and the eleven months to Nov. 30 is as follows:

	November.		Eleven months.	
	1886.	1885.	1886.	1885.
Earnings	$95.153	$85.381	$1,268,889	$1,199,147
Expenses	66,078	54,670	781,372	737,064
Net earnings	$29,075	$30.701	$487,517	$462,083

For the eleven months this shows an increase in gross earnings of $69,742, or 5.8 per cent., and an increase in expenses of $44,308, or 6.0 per cent., leaving a gain of $25,434, or 5.5 per cent., in net earnings.

ANNUAL REPORTS.

Cleveland, Columbus, Cincinnati & Indianapolis.

This company makes a statement for the year ending Dec. 31, the earnings and expenses for December partly estimated. The statement covers the operations of the whole system, including the leased lines.

The earnings for the year were as follows:

	1886.	1885.	Inc. or Dec.	P. c.
Earnings	$7,2 8,385	$6,411,445	I. $816,940	12.7
Expenses	4,766 793	4 929.274	D. 162,481	3.3
Net earnings	$2,461,592	$1.482,171	I. $979,421	66.1
Gross earn. per mile	9,788	8,705	I. 1.083	12.7
Net " "	3,333	2,012	I. 1,321	66.1
Per cent. of exps	65.9	76.9	D. 11.0	....

The comparison here is with the corrected figures for 1885:

The income statement is as follows:

	1886.	1885.	Inc. or Dec.	P. c.
Net earnings	$2,461,592	$1,482,171	I. $979,421	66.1
First charges	2,046,652	2,039,616	I. 7,036	0.3
Surplus	$414.940	*$557,445	I. $972,385	....
Additions to property	309,947	306,381	I. 3,566	1.2
Surplus	$104,993	*$863,826	I. $968,819	....

* Deficit.

No dividends were paid in either year. Additions to property include new equipment and permanent improvements of road.

Michigan Central.

A statement for the year ending Dec. 31 has been published by this company, the December earnings and expenses partly estimated. The comparisons are with the completed statement for 1885.

The earnings for the year were as follows:

	1886.	1885.	Inc. or Dec.	P. c.
Earnings	$12,250,000	$10,707,394	I. $1,542,606	14.1
Expenses	8,350,000	8,014,603	I. 335,397	4.2
Net earnings	$3,900,000	$2,692,791	I. $1,207,209	44.8
Gross earn. p. m.	8,088	7,091	I. 997	14.1
Net " "	2,575	1,783	I. 792	44.8
Per cent. of exps	68.2	74.8	D. 6.6	....

As with the Lake Shore, there was a large increase in earnings, with a small one in expenses.

The income statement for the year is as followt:

	1886.	1885.	Inc. or Dec.	P. c.
Net earnings	$3,900,000	$2,692,791	I. $1,207,209	44.8
Interest, rentals, etc.	2,578,000	2,666 753	D. $88,753	3.3
Surplus	$1,322,000	$26,038	I. $1,295,962	....
Mich. Cent., prop.	912,000	17,359	I. 894,641	....
Canada So., "	410.000	8,679	I. 401,321	....
Mich. Cent., per sh.	$4.87	$0.01	I. $4.86	....
Canada So., "	2.73	0.01	I. 2.72	....

For 1886 dividends have been declared of 2 per cent. on Michigan Central stock and 1¼ per cent. on Canada Southern. In 1885 no dividends were paid by either company. The surplus above does not include interest received on investments.

Lake Shore & Michigan Southern.

The following statement of the operations of this road for the year ending Dec. 31 has been published, the December earnings and expenses estimated.

The earnings for the year were as follows:

	1886.	1885.	Inc. or Dec.	P. c.
Earnings	$15,826,616	$14,13?,506	I. $1,693,110	11.9
Expenses	9,709,135	9,287,537	I. 421,598	4.5
Net earnings	$6,117,481	$4,845,969	I. $1,271,512	26.2
Gross earn. per mile	11,868	10,515	I. 1,293	11.9
Net earn. per mile	4,564	3.616	I. 948	26.2
Per cent. of exp.	61.3	65.7	D. 4 4	....

The improved conditions of business are well shown in the large increase in earnings and the comparatively slight increase in expenses.

The income statement for the two years is as follows:

	1886.	1885.	Inc. or Dec.	P. c.
Net earnings	$6.117,481	$4,845,969	I. $1,271.512	26.2
Int., rentals, etc	3,719,135	3,867.456	D. 148,321	3.9
Surplus	$2,398,346	$978,513	I. $1,419,833	145.1
Surplus, per share	$4.84	$1.98	I. $2.86	145.1

The surplus for 1886 is equivalent to $4.84 per share. From this one dividend of 2 per cent. has been declared, which will take $989,380, leaving a balance of $1,409,016. There were no charges to construction, all improvements being paid for out of income. In 1885 no dividends were paid.